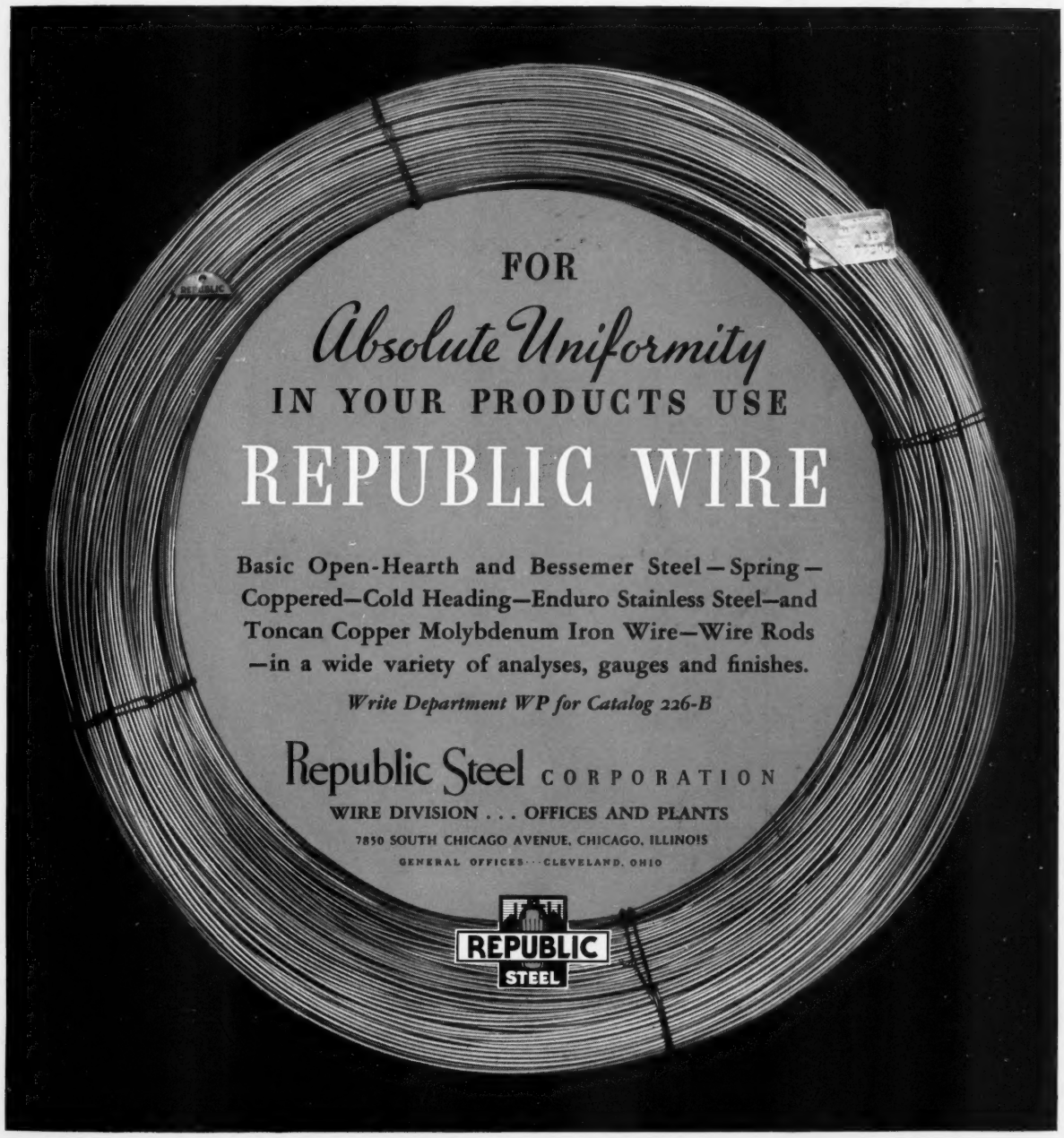
WIRE AND WIRE PRODUCTS

JUNE 1936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Absolute Uniformity
IN YOUR PRODUCTS USE
REPUBLIC WIRE
Basic Open-Hearth and Bessemer Steel—Spring—Coppered—Cold Heading—Enduro Stainless Steel—and Toncan Copper Molybdenum Iron Wire—Wire Rods—in a wide variety of analyses, gauges and finishes.
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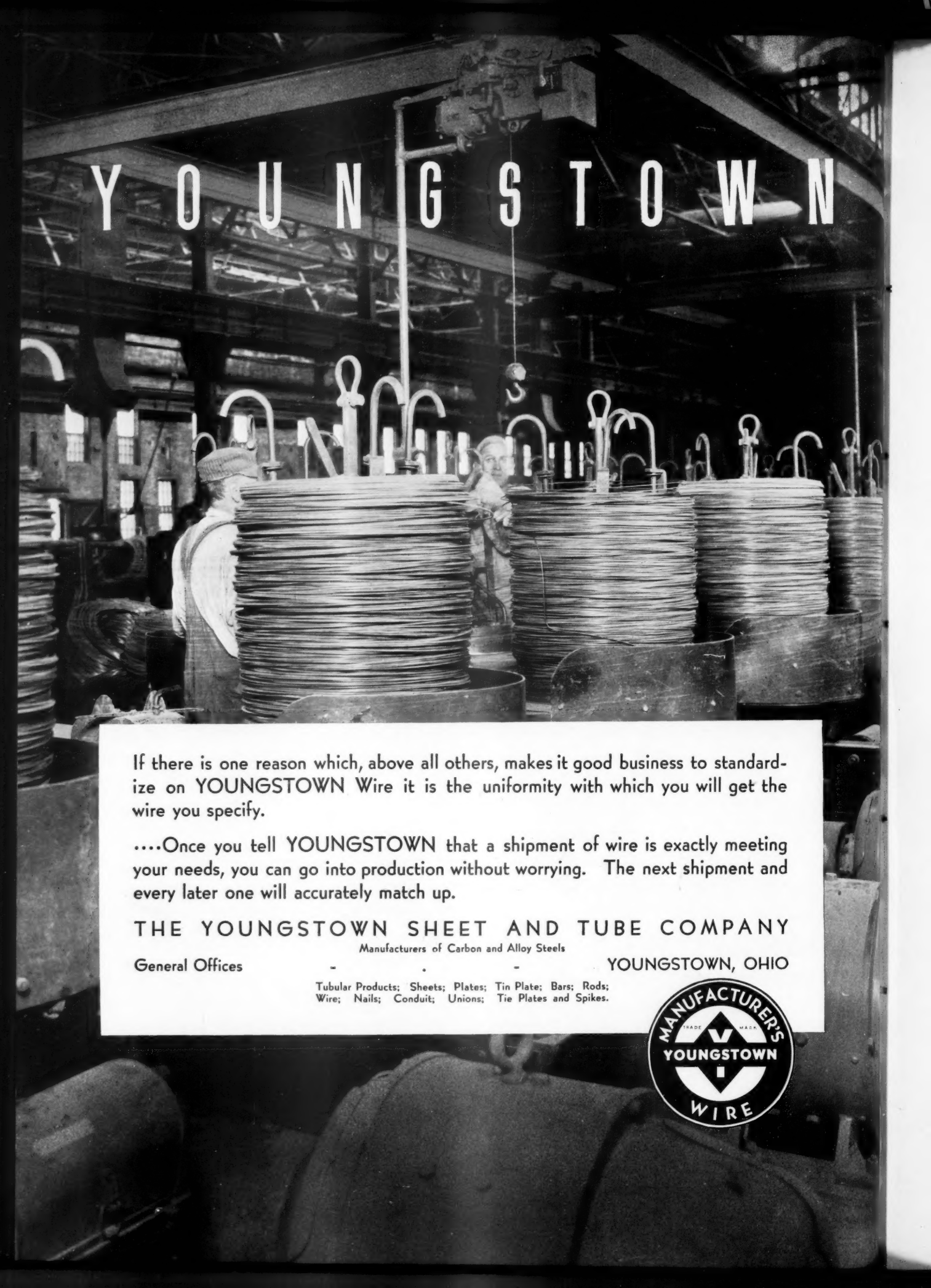
GENERAL OFFICES . . . CLEVELAND, OHIO
REPUBLIC
STEEL

OFFICIAL PUBLICATION OF THE WIRE ASSOCIATION



If there is one reason which, above all others, makes it good business to standardize on YOUNGSTOWN Wire it is the uniformity with which you will get the wire you specify.

....Once you tell YOUNGSTOWN that a shipment of wire is exactly meeting your needs, you can go into production without worrying. The next shipment and every later one will accurately match up.

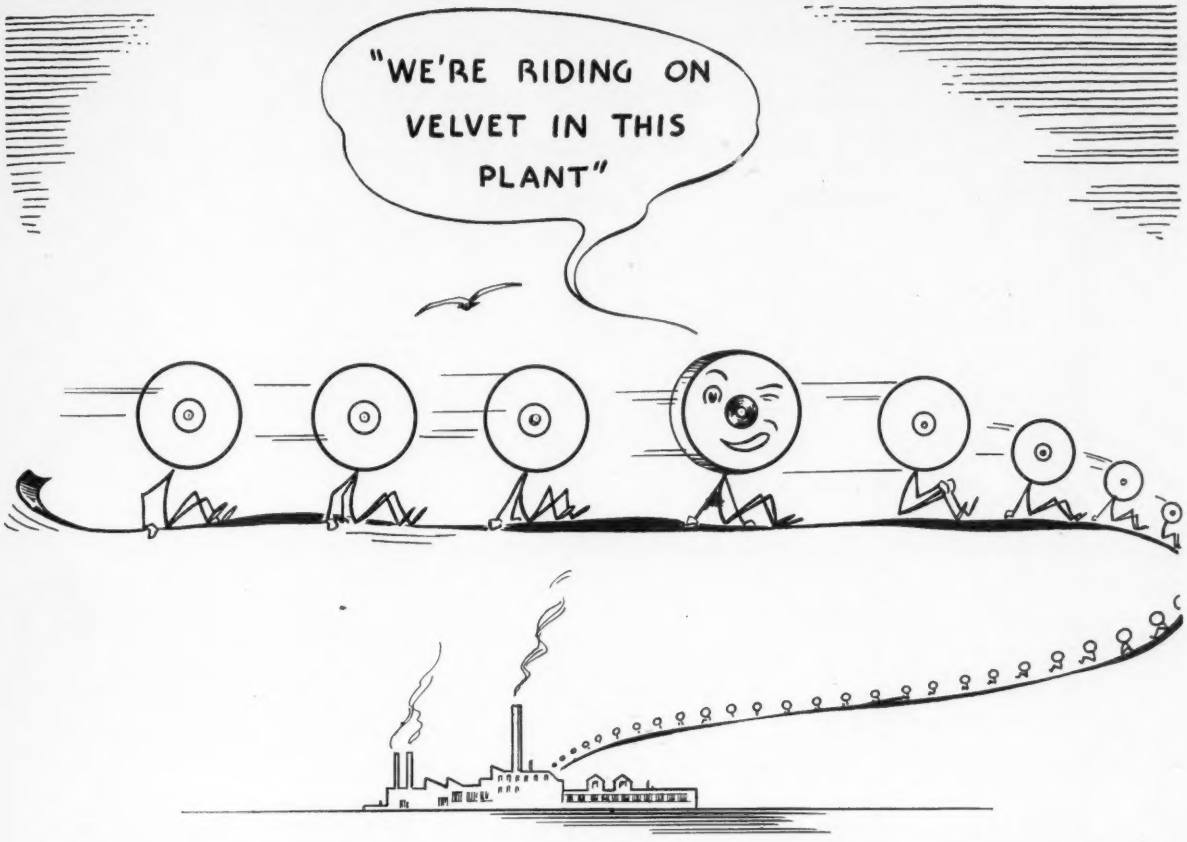
THE YOUNGSTOWN SHEET AND TUBE COMPANY

Manufacturers of Carbon and Alloy Steels

General Offices - . - YOUNGSTOWN, OHIO

Tubular Products; Sheets; Plates; Tin Plate; Bars; Rods; Wire; Nails; Conduit; Unions; Tie Plates and Spikes.

MANUFACTURER'S TRADE MARK YOUNGSTOWN WIRE



ONE large user of Carboloy dies reports that their investment in several thousand dies has already paid for itself and has produced a 200% dividend to date with the dies still in good condition. This mill reports that, based on present performance, they anticipate a 1500% return on their investment.

Such outstanding savings have been made possible by the use of a uniform, dependable die material, properly applied and correctly maintained.

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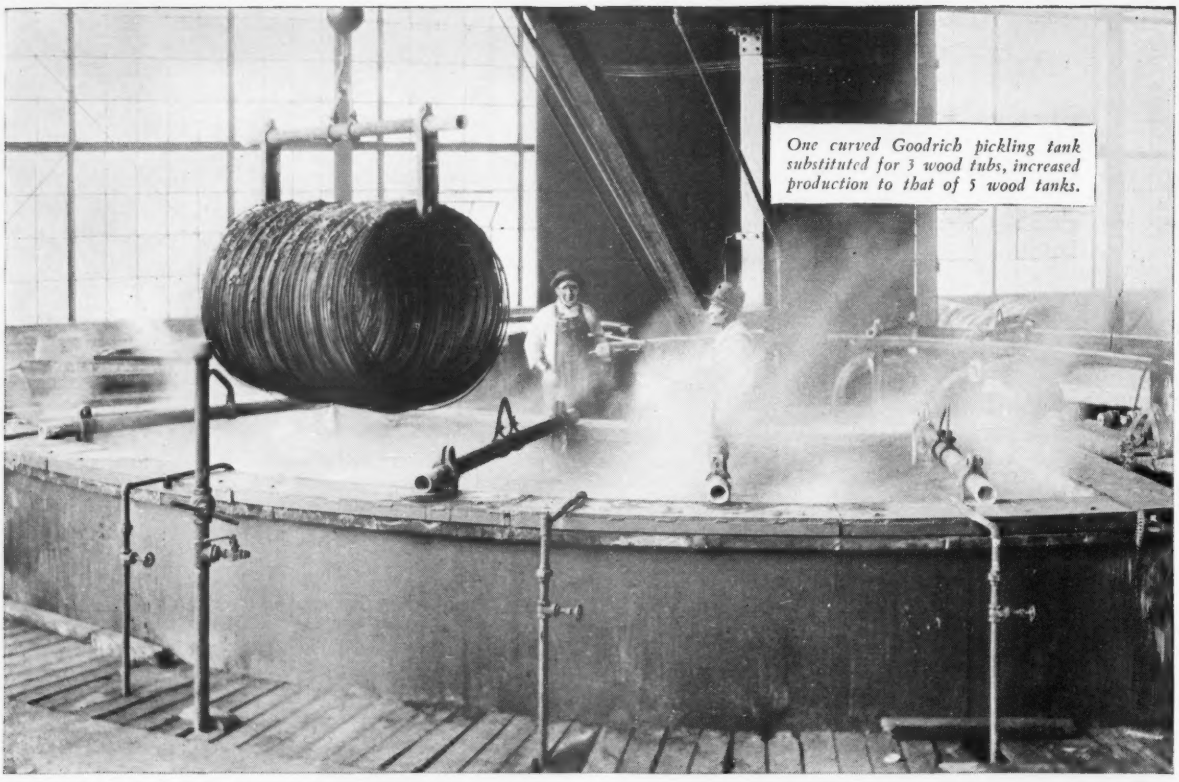
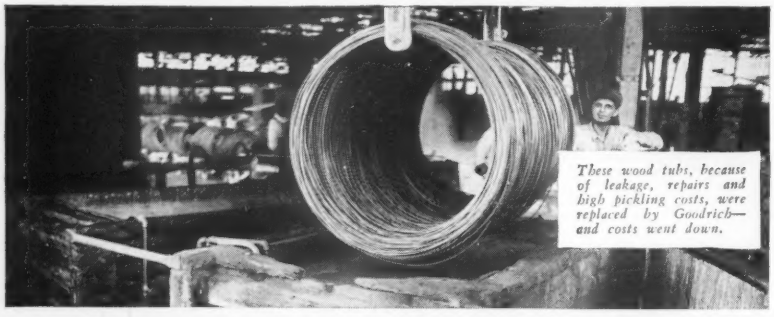


One curved Goodrich pickling tank substituted for 3 wood tubs, increased production to that of 5 wood tanks.

One Goodrich Pickling Tank Replaces Three – Does the Work of Five

A well-known wire mill, employing the "cleaning circle" pickling method, recently replaced three individual wood tubs with one curved Goodrich rubber-lined steel tank. The one curved tank was fitted into the same place formerly occupied by the three and increased production to that of five wood tanks.

Goodrich rubber lining not only permits a tank design best suited to your needs but also puts an end to those costly acid losses, repairs and shut-downs caused by leakage. Goodrich tanks don't leak because they are lined with Triflex rubber—a layer of hard rubber vulcanized between two layers of soft rubber and fitted with expansion joints. Where subjected to severe service, the rubber lining is protected by a sheathing of acid-resistant brick.

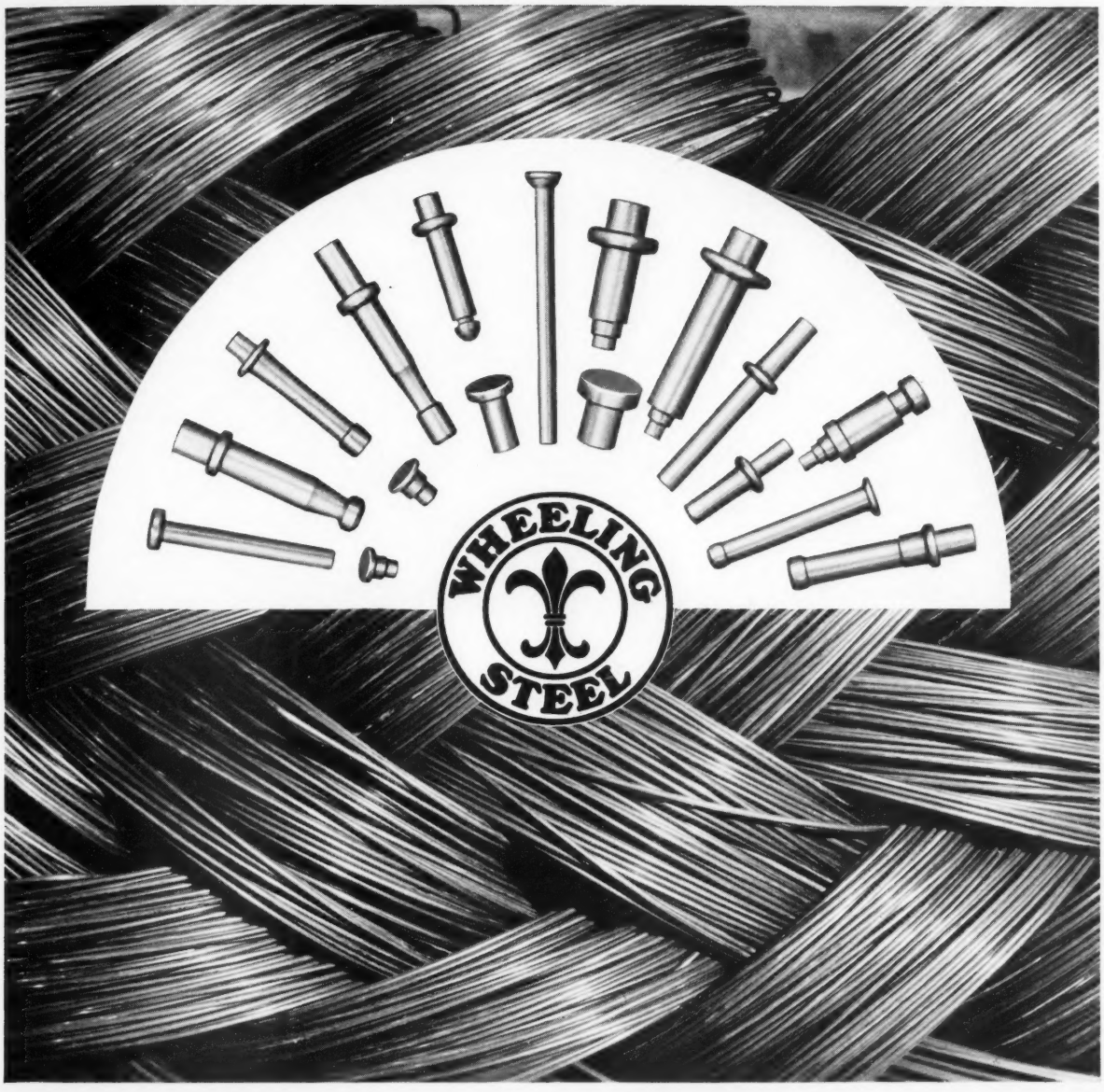


These wood tubs, because of leakage, repairs and high pickling costs, were replaced by Goodrich—and costs went down.

We will be glad to submit the facts and figures on how Goodrich tanks can lower your pickling cost per ton. Write The B. F. Goodrich Company, Mechanical Rubber Goods Division, Akron, Ohio. (In Canada: Canadian Goodrich Co., Ltd., Kitchener, Ont.)

ALL *products problems* IN RUBBER

Goodrich *Rubber Lining*



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Specially Processed Copper Wire...

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ESPECIALLY MADE FOR METALLIZING

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High Conductivity Electric Wire

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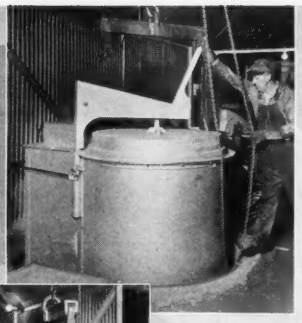
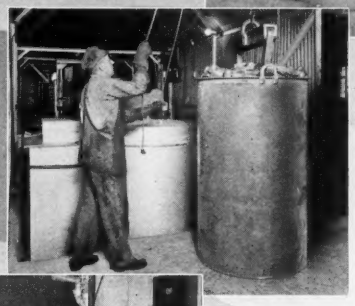
CYCLONE'S New Friends New Records



Athey Truss Wheel Co.
Chicago, Illinois



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Cleveland Wire Spring Co.
Cleveland, Ohio

The Cyclone sweeps on—setting new records in furnace performance and reaching wider distribution in every industry. One installation sells another and the frequency of repeat orders is the best evidence that Cyclone users are getting results which they can only maintain by the Cyclone standard of efficiency, as measured by speed and uniformity in heating, extreme accuracy in tempering and demonstrated economy in operation.

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CYCLONE

Tempering **Furnace**

Lindberg Engineering Co.

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Manufactured By

ELEVATOR SUPPLIES COMPANY, Inc.

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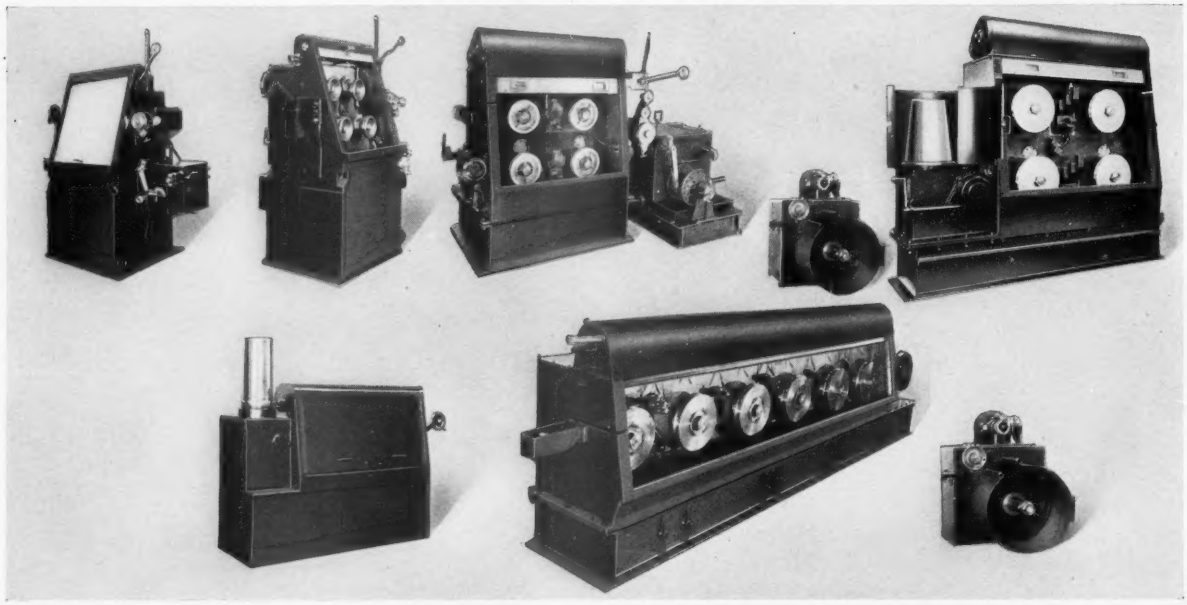


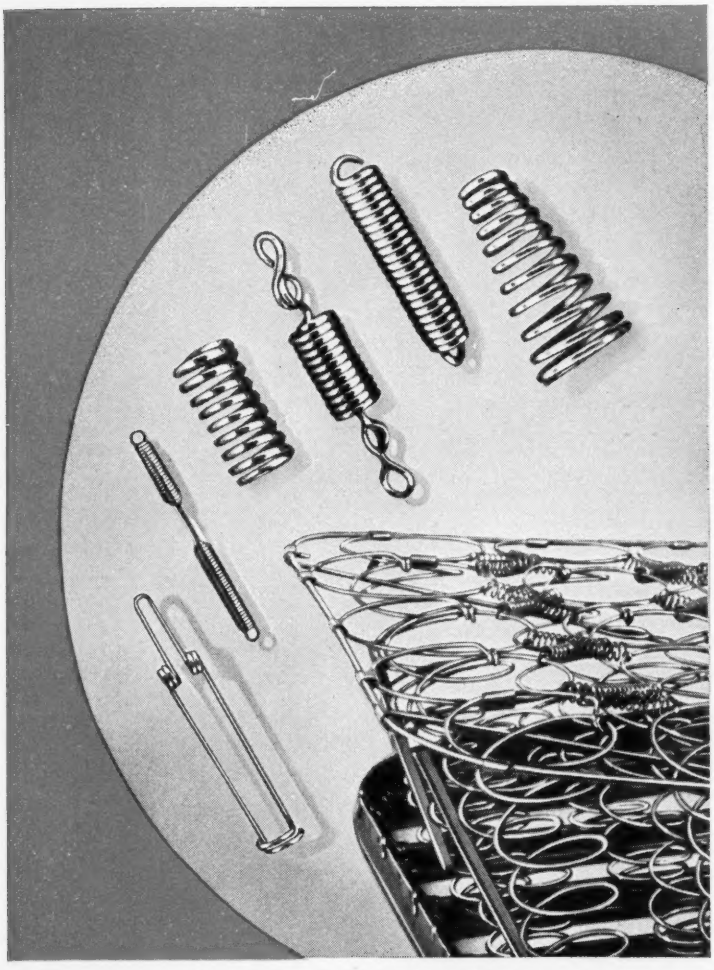
A complete line, minimum slip, wire drawing equipment built primarily for high speed wire drawing production. Liberal proportioning, anti-friction mounting, efficient power transmission, freedom from belts or chains, positive variable speed drive to spoolers to maintain uniform wire speed, accurate wire tension control at the point of spooling are a few of the features contributing to long life, efficient operation, economical production, clean and excellently wound quality wire.

Type of Machine	A	B	C	D	BB	F
With or without Spoolers	Yes	Yes	Yes	Yes	Yes	Yes
With or without Coiler	Yes	Yes	Yes	Yes	Yes	Yes
Size of finished wire B&S gauge	#34-#44	#26-34	#18-26	#12-22	#26-34	#2-#12
Number of Dies	16	16	12 or 13	13	13	5-7-9-11 or 13
Finished Wire Speed-FPM	5000	5000	4000	3500	2500 to 3500	2500 & 1000

Let us show you what our equipment can do towards cutting production cost and improving quality.

For Speedy Production of Quality Springs

Standardize on J&L Spring Wire



Increased production, and definite assurance of uniform high quality springs—these are advantages you get when you standardize on J & L Spring Wire.

J & L Spring Wire helps you increase production, because it lends itself so readily to coiling, crimping, knotting and other forming incident to spring making. It assures uniform high quality springs because it has the resilience to provide just the right springiness, and the stamina to hold that springiness indefinitely.

The high quality of J & L Spring Wire results from the use of special steel, exact heat treating, accurate drawing and critical inspections and tests to insure uniformity to specifications.

The wide variety of springs made of J & L Spring Wire, a few of which are illustrated here, emphasizes the satisfaction with which it is being used throughout industry.

Many manufacturers have standardized on J & L Spring Wire because of its uniform high quality, and because it has the correct balance of physical properties to permit uniform, speedy production of springs of superior quality.

You, too, will find that it will pay you to look to J & L Spring Wire for *your* requirements.

J&L STEEL

OTHER J&L PRODUCTS

For Manufacturing: Cold Heading Wire—Forging Steel—Jalcase Steel—Improved Bessemer Screw Steel—Shafting—Tubing—Tin Plate, Black Sheets, and Light Manufacturing Ternes, Tin Mill Sizes—a full line of S.A.E. Carbon Steel.

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AMERICAN IRON AND STEEL WORKS
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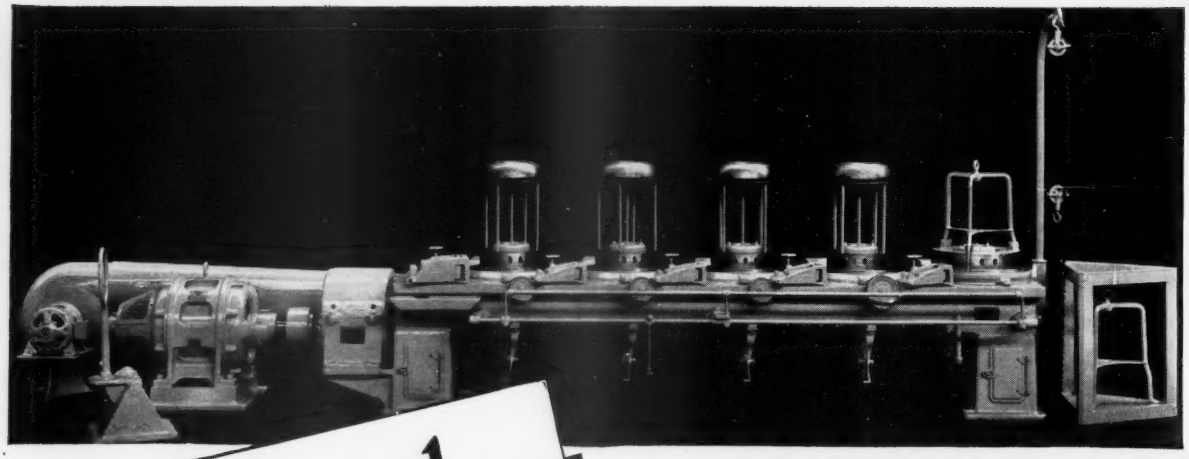
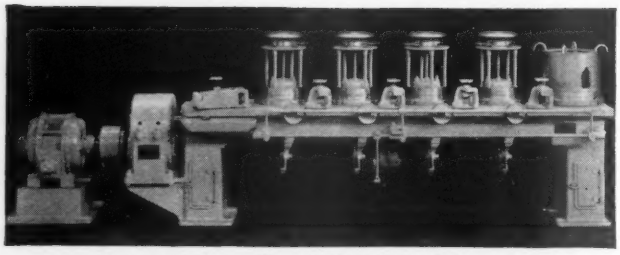
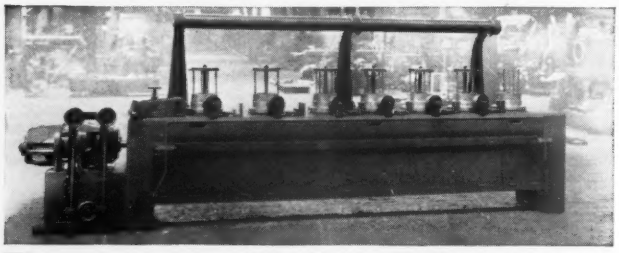


Morgan-Connor Continuous Wire Machine, Type B. Fully equipped with motor and control, air-cooling system, clutches and safety stops. Designed to start from commercial No. 5 rod in either high carbon or softer grades.

More miles per man



Morgan-Connor Continuous Wire Machine, Type C. Fully equipped with motor and control, clutches and safety stop. Machine takes wire either hard drawn or annealed. Patented wire can be started at about 11 gauge.



W4

Morgan-Connor Continuous Wire Machine, Type D. This machine is designed especially for the drawing of finer sized wire. Starts from No. 17 patented wire.

● Morgan-Connor Continuous Wire Machines incorporate many distinct improvements in wire drawing procedure . . . improvements which permit greater tonnage per unit—more miles per man.

Our high block design eliminates objectionable slippage, affords ample storage between dies and permits proper cooling. Coil tension is reduced—speed at which wire leaves one block is determined solely by the demands of the next.

Butt welding, permitting continuous operation for the full life of the dies, is made possible by individual clutches.

Compact strength is manifested in every unit. Unnecessary floor space is eliminated.

Safe, easy operation is a feature. An A.C. or adjustable speed D.C. motor can be supplied as desired. Adequate safety features protect the operator.

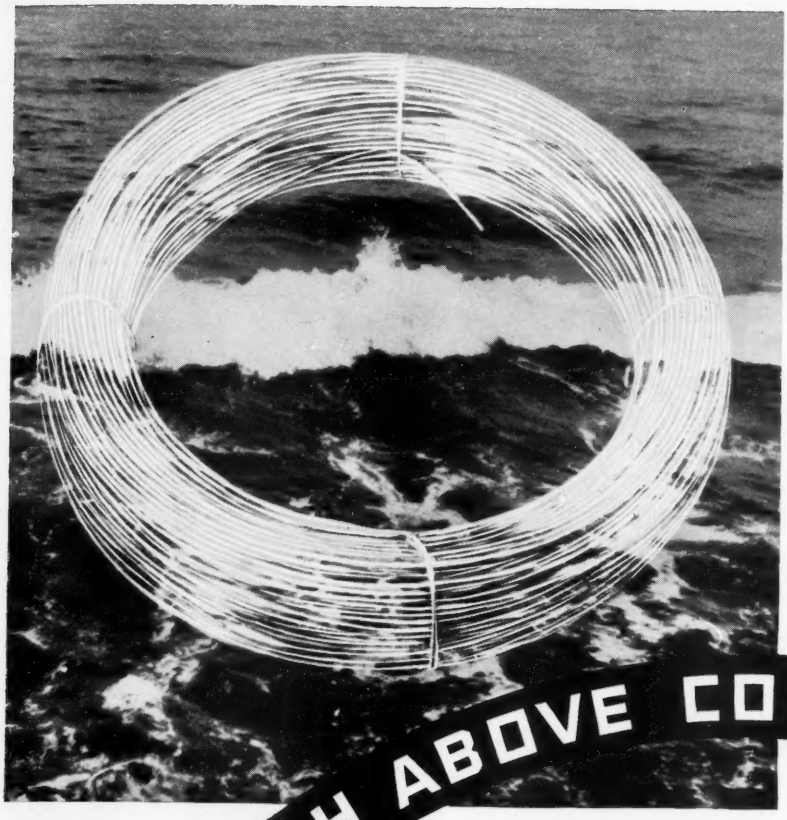
Morgan-Connor Wire Machines are designed to increase output and reduce costs.

MORGAN CONSTRUCTION COMPANY

Worcester, Massachusetts, U.S.A.

Wire MORGAN Machines

MORGAN WORCESTER ENGINEERS AND MANUFACTURERS



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FOR the manufacture of springs, wheels, pinions, screws, bushings and hundreds of other parts and fittings that must not "freeze" in service when exposed to damp, corroding conditions, remember the name, SEYMOUR PHOSPHOR BRONZE.

This is an alloy of copper and tin purified by the addition of phosphorus. A marked characteristic is its excellent resistance to corrosion. Neither fresh nor salt water moisture affects its service under conditions that would disintegrate many other metals.

This makes it highly dependable for parts in meters, clocks, pumps and scientific instruments used at sea and in other moist areas.

Because of resistance to corrosion, toughness and extreme elasticity, a heavy tonnage of Seymour Phosphor Bronze is made into spring contacts in electric switches. If you have a corrosion or "fatigue" problem, we will gladly send samples for test purposes.

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SEYMOUR

PHOSPHOR BRONZE

THE SEYMOUR MANUFACTURING CO. 62 FRANKLIN ST., SEYMOUR, CONN.

SPECIALISTS IN PHOSPHOR BRONZE AND NICKEL SILVER

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WIRE AND WIRE PRODUCTS

A monthly publication devoted to the production of Wire, Rod and Strip Wire Products and Insulated Wire and Cable

DRAWING—ROLLING—EXTRUDING—FORMING—FABRICATING

Vol. II June 1936 No. 6

Designated as

Official Publication By The Wire Association

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4 —	.2253
4 ¼	.221
4 ½	.216
4 ¾	.212
5 —	.207
5 ¼	.203
5 ½	.200
5 ¾	.196
6 —	.192
6 ¼	.188
6 ½	.185
6 ¾	.181
7 —	.177
7 ¼	.173
7 ½	.170
7 ¾	.166
8 —	.162
8 ¼	.159
8 ½	.155
8 ¾	.152
9 —	.1483
9 ¼	.145
9 ½	.142
9 ¾	.138
10 —	.135
10 ¼	.131
10 ½	.128
10 ¾	.124
11 —	.1205
11 ¼	.117
11 ½	.113
11 ¾	.109
12 —	.1055
12 ¼	.102
12 ½	.099
12 ¾	.095
13 —	.0915
13 ¼	.089
13 ½	.086
13 ¾	.083
14 —	.080
14 ¼	.078
14 ½	.076
14 ¾	.074
15 —	.072
15 ¼	.070
15 ½	.067
15 ¾	.065
16 —	.0625
16 ¼	.060
16 ½	.058
16 ¾	.056
17 —	.054
17 ¼	.052
17 ½	.051
17 ¾	.0491
18 —	.0475
18 ¼	.0459
18 ½	.0443
18 ¾	.0426
19 —	.0410
19 ¼	.0394
19 ½	.0379
19 ¾	.0363
20 —	.0348
20 ¼	.0340
20 ½	.0332
20 ¾	.0325
21 —	.0317
21 ¼	.0309
21 ½	.0301
21 ¾	.0294
22 —	.0286
22 ¼	.0279
22 ½	.0272
22 ¾	.0265
23 —	.0258
23 ¼	.0251
23 ½	.0244
23 ¾	.0237

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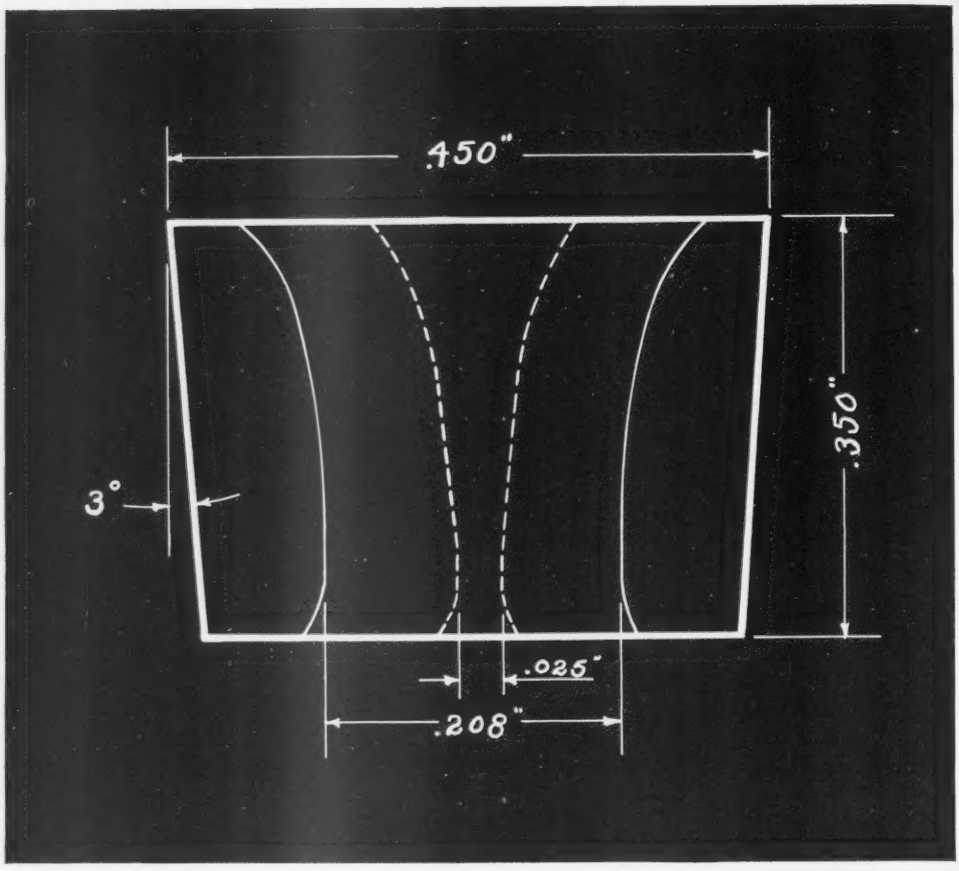
MAXIMUM GUARANTEED RECUT VALUE OF THIS SIZE DIE



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FIRTHALOY Sintered Carbide Dies, Firtheld Cased, give extra performance at no additional cost. For instance, the Firthaloy Die Nib, illustrated above, was purchased at size .025 inch and carried a guaranteed recut value of .156 inch maximum. But, instead of the die being discarded it was continued in use and recut on through successive sizes to .208 inch, producing many additional tons of perfect finished wire.

This performance is being duplicated regularly by many large wire manufacturers, throughout the country, who specify Firthaloy Dies, Firtheld Cased, for all wire drawing operations.

Our Firthaloy Engineers will be glad to explain the additional performance that can be obtained through the use of Firthaloy Dies, Firtheld Cased, in your plant. Call on them!

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DETROIT LOS ANGELES
PHILADELPHIA
GLOBE WIRE DIVISION
McKEESPORT, PA.

WIRE AND WIRE PRODUCTS

A monthly publication devoted to the production of Wire, Rod and Strip.
Wire Products and Insulated Wire and Cable.
DRAWING --- ROLLING--- EXTRUDING --- FORMING --- FABRICATING

Vol. II | JUNE 1936 | No. 6

Keeping Pace With Progress

By J. H. Shilling,
The Youngstown Sheet & Tube Co.
Superintendent, Rod and Wire Mill, Youngstown, Ohio

Flexible production equipment gives security to wire mills confronted by exacting demands from industrial buyers.

THE expansion of markets for wire and wire products today lends emphasis to changes which have occurred within the wire industry over the past five years. Confronted by ever more exacting demands, producers have been compelled to find ways and means of maintaining constant quality and yet meeting a multitude of different metallurgical and physical specifications.

✦ ✦ ✦

THE increasing importance of the automobile industry as a consumer of high grade spring wire and heat treated medium carbon and alloy bolts has necessitated the installation of precise process heat treating equipment. The increasing severity and range of cold upsetting attempted by the makers of nuts and bolts has called for improvements in steel making practice and surface conditioning. The demand for high speed machine cutting properties, along with good forging quality, has narrowed the allowable chemical ranges on screw and nut stocks. The insistence of the buyer on uniformity of temper from coil to coil and from shipment to shipment has brought about closer tolerances in the rolling mills, closer control of cold reduction in the wire die and closer control of chemical content.

✦ ✦ ✦

Fig. 1—Heat and specification numbers stamped on ends of billets preparatory to rolling into rods. ✦ ✦ ✦ ✦ ✦

JUST as continuous strip mills have revolutionized the flat rolled products industry, wire mill operators also have had to meet the more exacting requirements with new and existing equipment. How the industry has adapted all available facilities to meet rigid requirements on a broad diversity of new products can be seen from the story of a single mill.

✦ ✦ ✦

72 Different Specifications of Billets Carried In Stock

WITHIN the experience of some of our operators, the billet stock carried at the Struthers plant of The Youngstown Sheet & Tube Co., contained only two specifications, i. e. Bessemer and low carbon open hearth. Today the stock consists of over 72 different specifications, each of which is significantly different in regard to either chemical composition or steel making practice. The variety of screw stocks, cold heading stocks, galvanizing steels, spring and rope

Designated as Official Publication by the Wire Association

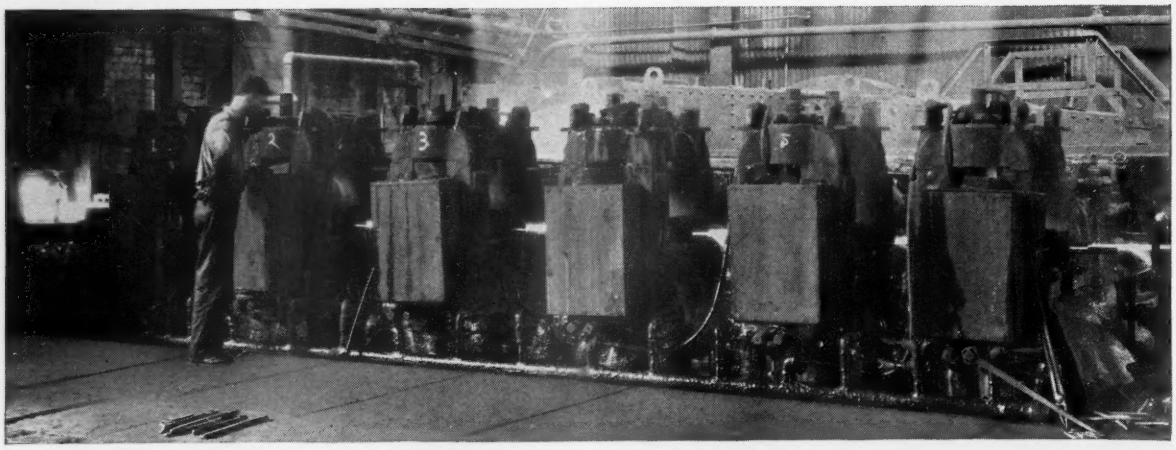

Fig. 2—Morgan type rod mill.

wire steels is almost legion. Each addition as it comes along is an effort to satisfy the exacting demands of some customer who feels (and probably rightly so) that only the steel for which he asks will do for his particular job.

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A Foolproof Identification System

TO insure the proper application of this careful selection of steel to orders, each billet must be positively identified at the time it is rolled. One end of each billet is stamped at the hot mill with code numbers that give its complete steel making history and the heat from which it was rolled. After it leaves the billet mill with this coded information for identification, it is sent to the inspection beds. Here each billet is subjected to a rigid surface inspection for surface imperfections and piping. Surface preparation varies according to the ultimate use of the rod or wire. Stock for spring wire and wire

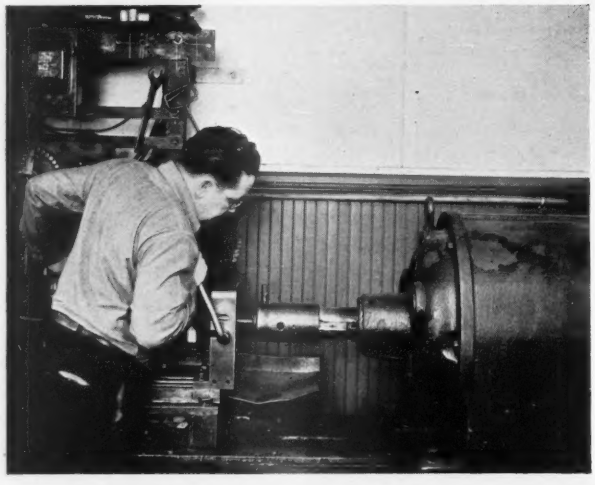

Fig. 3—Twist test on wire to determine possible surveys or internal defects.

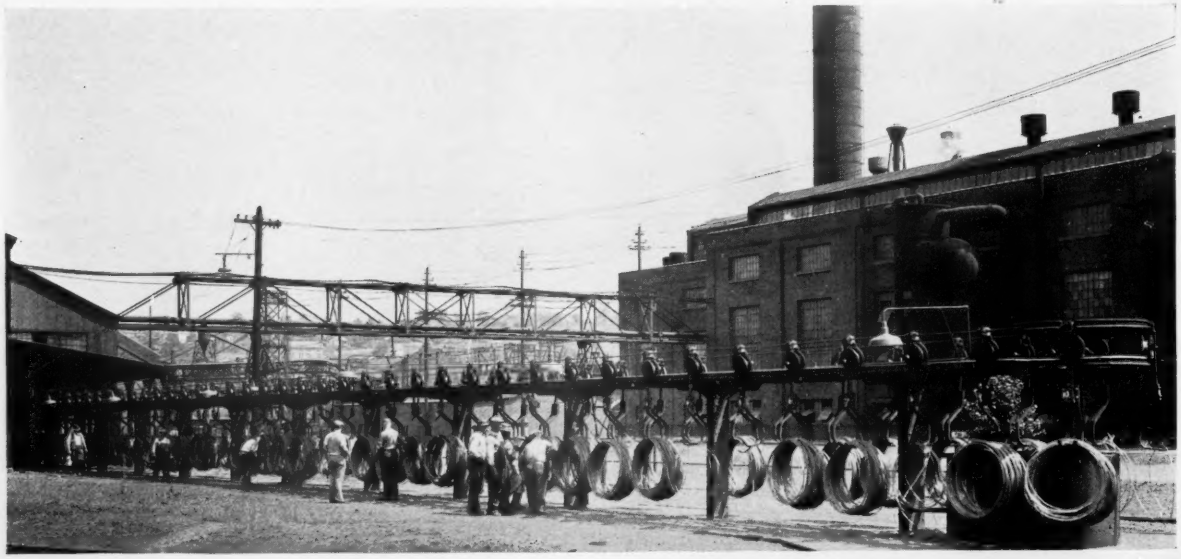

Fig. 4—THE COOLING CONVEYOR. The rods are cooled on this conveyor and inspected for dimension, possible defects or seams. The crop ends are trimmed off and each bundle is tagged for specification. Rods are now prepared for shipment or transfer to the drawing department.

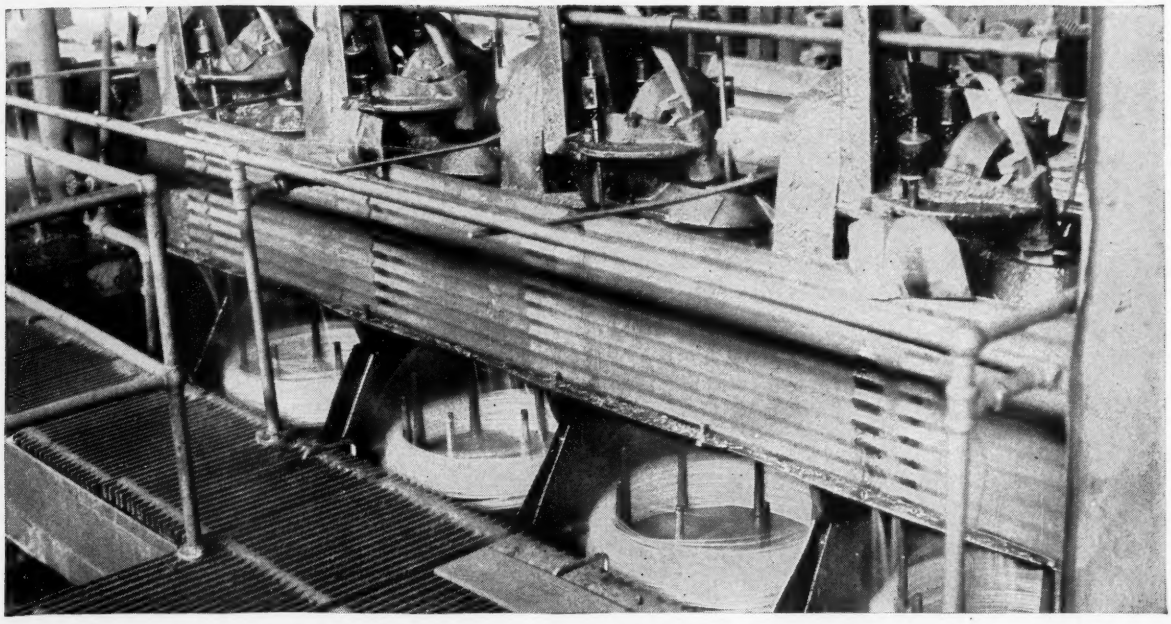

Fig. 3-A—THE LAYING REELS. The finished rods are reeled into bundles weighing about 340 lbs. each. Two bundles are coiled at the same time. The delivery speed on No. 5 rods is about one mile per minute. Bundles are removed from the coilers onto flat conveyor, then to cooling conveyor.

Fig. 5—Rod storage warehouse.

which is to be severely cold headed or upset is given a particularly critical inspection for every type of surface defect and such billets as are prepared to pass this inspection are painted on the ends to further identify their quality.

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AS raw material then for our rod mills, we have a stock covering 72 different chemical specifications, with billet surfaces properly conditioned by careful inspection and chipping.

✦ ✦ ✦

Youngstown Rod Mills

YOUNGSTOWN has two rod mills covering a range of sizes from 1.000″ to .207″. Both are equipped to roll a 360 pound billet of 1 7/8″ square section. One, a Morgan semi-continuous mill, rolls sizes from 1.000″ to .312″ inclusive; the other a two strand continuous Morgan mill, rolls round sections from .375″ to .207″ inclusive.

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WHEN the type of steel being charged into the heating furnace is changed, men on the discharge end of the furnace are notified; a red metal flag is placed on the coil as it is discharged from the reels and the heater or assistant follows the starting bundle and sees that the first coil of rod is properly identified at the end of the mill.

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Handling Rod Coils

EACH coil has an inspection for slivers and surface imperfection on the hot conveyor as well as one for proper size. In addition, each coil of rods for cold heading and forging purposes is sampled on both ends of the coil. These samples are submitted to the metallurgical department for twist testing, which consists of clamping one end of the sample and rotating the other end from 720° to 1440° and then back to the original position. This test opens up any seams or laps not discernible by visual inspection. It has proved to be even more severe than an actual upsetting operation and checks the pickling test very closely. After this careful check on quality, Youngstown rods are considered fitted and fit for the specific purpose for which they are sold. They are tailor made coils, which can be depended on to work under conditions where cold distortion has reached a maximum. Coils are placed on 170 individually numbered hooks aboard a traveling cooling rack as they come from the rod mill and tests are taken from each coil. Then, tagged with the identifying data, they are ready for storage or production into finished wire.

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Fig. 6—Rods used in the drawing of various kinds of wire for special requirements, or finished, are prepared in the wire mill cleaning house. In this section are the pickling tanks, rinse tubs, lime vats and sulling rack where rods are prepared for drawing. ✦ ✦ ✦

Rod Storage For Quick Service

WHILE the rod mills usually cover the entire range of sizes every week, to take care of all rod and wire orders, a rod storage building with a capacity of 3,000 tons has been provided to further expedite service to customers. Many consumers are becoming increasingly reluctant to carry rod stocks and expect and get twenty-four hour service in many cases.

Fig. 7—Baking ovens.

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THE rod storage building is divided into seven bays of three compartments each. Each compartment accommodates five rows of rods across its width and each row is serviced by an overhead track. A Monorail crane operating on these tracks, carries the operator to any part of the storage building where, with the aid of an electrically operated horizontal hairpin hook, he picks up from one to nine bundles of rod with the same facility that one selects his breakfast doughnut. The track which leads from the rod cooling conveyor and the track that goes into the cleaning house are both equipped with scales. Every pound of prime rods from the mill must pass over these scales, the recorded weights of which are an integral part of the materials accounting system.

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The Cleaning Operation

THE cleaning house which lies between the rod storage building and the wire mill is serviced by an elongated oval track. Under one side of the oval is a rust coat conveyor with spray pit capable of accommodating 20,000 lbs. of rods at a time and on this side there is also two lime tanks, each with a different suspension of lime. Under the other side of the track are five individual brick pickling tanks with an individual capacity of 6,000 lbs. of rods per tub per charge. Each is maintained at a different temperature or acid concentration whenever the variety of stock passing through the cleaning house so requires. Next to the last pickling

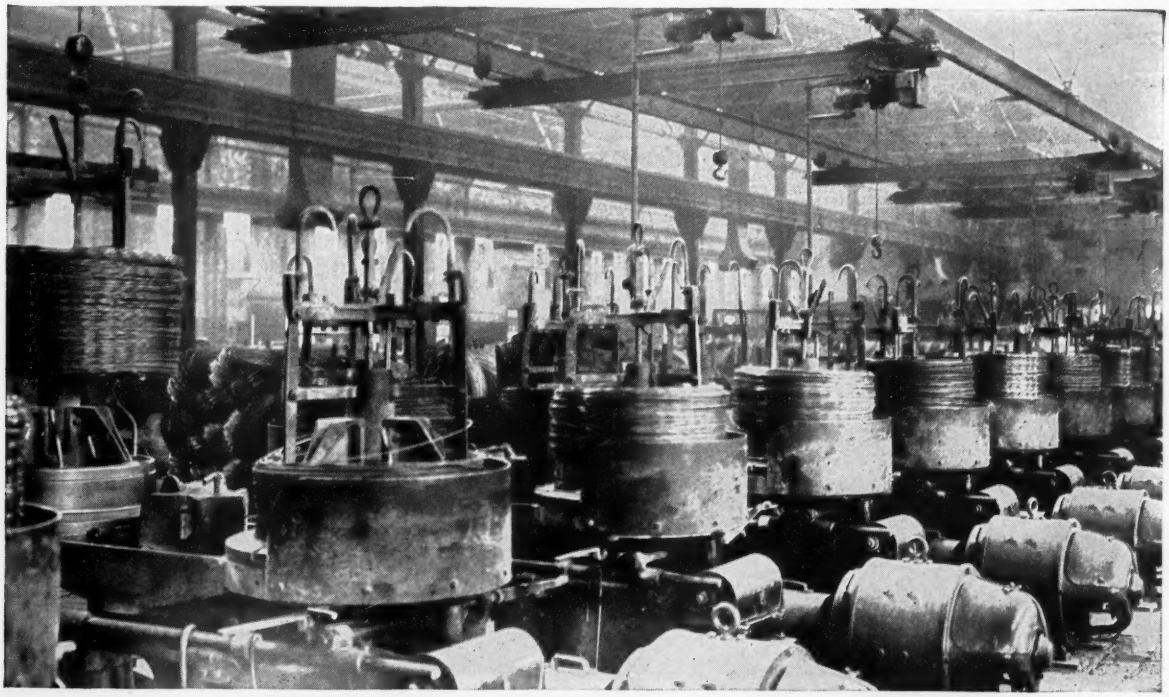

Fig. 8—NULLMEYER WIRE DRAWING BLOCKS. The prepared rods are drawn on these individually motor driven blocks. The wire is here shuttled back and forth, through a special die, from one block to another, until desired size is obtained. ✦ ✦ ✦ ✦ ✦

Fig. 9—Removing batch of rods from normalizer. ✦ ✦ ✦ ✦ ✦

tank is another lime tank and a clear water wash with a high pressure hose to insure absolute cleanliness of the rod surface. Acid feed and discharge lines are all gravity lines.

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FIVE ton cranes operated from the floor of the central aisle by the pickler carry charges of nine bundles of rods on horizontal hairpin hooks. Bessemer, medium carbon bolt steels, chrome-nickel and manganese alloy steels, high carbon spring wire and rods, annealed wire and low carbon basic all pass over this short length of track in a day without a sacrifice of the proper treatment. Exacting finishes required for plating wire, welding wire, bolt wire and spring wire all have the basis of their preparation in this cleaning house.

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EIGHT gas fired baking ovens 50 feet in length serve as drying, baking and storage capacity for rods that are ready for the wire mill. When the coils have finished their cycle in the cleaning house they are loaded onto trucks directly by the crane. The trucks are pushed into the baker, immediately adjacent, and are pushed along inside on a web track which carries them to the farthest side, adjoining the wire mill, where one gasoline and three electric trucks tow them to the wire drawing blocks.

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Wire Mill Set Up For Flexibility

IN the wire mill the equipment has been selected as to types and speeds to allow for the most exacting drafting requirements on all classes of wire. Four types of machines are in use at the present time: Nullmeyer turntable machines with individual motor drives; four die continuous machines of the Morgan and Sterling type; one double-deck block of the Vaughn type, and several of the older bench type with shaft driven multiple blocks.

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THE Nullmeyer and Vaughn machines have changeable speed gears for different types of wire. Each type has its advantages and special uses and the combination of them makes a particularly flexible mill for merchant wire production. Much of the different equipment has interchangeable blocks so that the coil diameter can be suited to the desire of the customer, whose wants in respect to coil diameter and finish are often unpredictable.

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Tungsten Carbide Dies Used

ALL machines use tungsten carbide dies which give the user assurance of uniform size not only from end to end of the individual coil but from coil to coil of the shipment. This type of die has also brought about an improvement of the surface of wire for plating work. In recent months the die room has been completely re-equipped with new equipment for roughing out, sizing and finishing tungsten carbide dies. This installation represents the latest development for the production of dies capable of maximum precision and finish control on wire surfaces. It will assist the mill in maintaining quality standards in the face of future production demands.

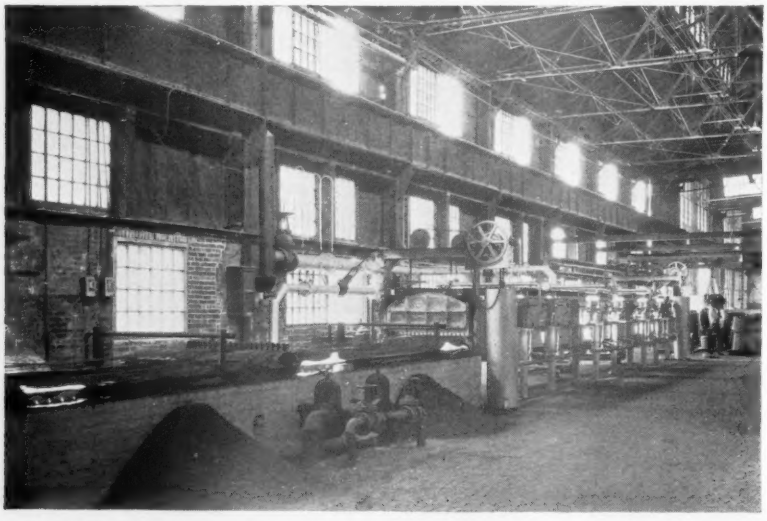
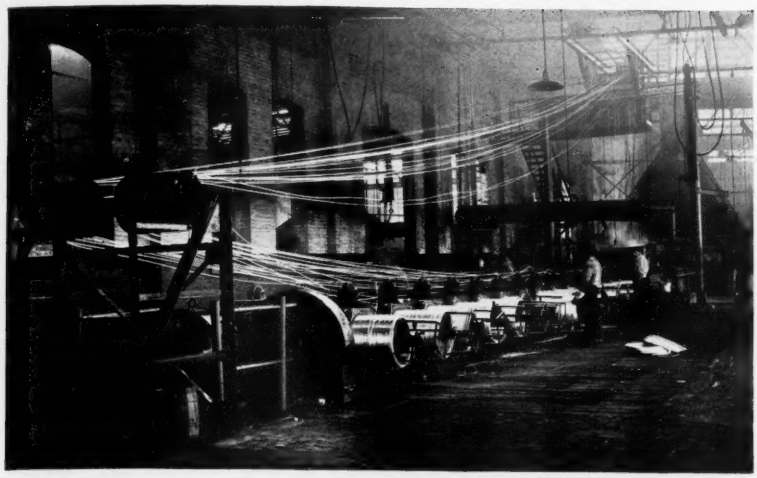
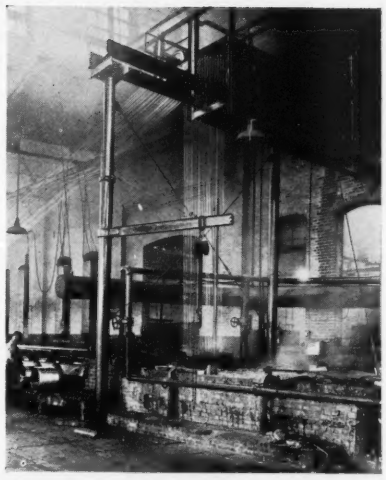


Fig. 10—This installation for patenting wire is unique as to burner arrangement and represents the latest development in equipment for heat treating high carbon spring and rope wire. The furnace is pyrometrically controlled, assuring a high quality product. ✦ ✦ ✦





Figures 11 and 12—This galvanizing unit manufactures either double galvanized or close wiped wire. For double galvanized wire the strands leave the pot in a vertical position. For close wiped wire they leave the pot on a horizontal plane on their way to the reeling blocks.

Heat Treating to Suit Uses

PERHAPS the most recent development in the wire industry is the increasing use of alloy and heat treated carbon steel bolts, particularly in the automotive industry. These materials are cold drawn and cold formed most economically after a softening treatment. The most desirable type of treatment is still subject to much discussion by the trade.

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THE Youngstown mill has adopted the pit type batch furnace in preference to the continuous type in use in some mills. Two types of process softening treatments have been developed to suit the demands of the individual purchaser. One is a high temperature anneal (called normalizing by the trade) which attains softening by grain growth and maximum ferrite precipitation around the pearlitic grains. The other is a low temperature anneal in which the softness of the finished material results from partially spheroidizing the cementite. The latter may be used on carbon steels but must be used on certain of the alloys. The first may be used on low and medium carbon steels.

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The Pit Type Furnace

IN the pit type furnace, the rods are heated from room temperature to the maximum temperature required in an alloy pot set in a vertical cylindrical furnace. After completing the heating cycle they are transferred to another pit to cool. A vertical stem is the carrying medium. Except for the transfer time, the rods are always enveloped by an atmosphere manufactured in a small secondary furnace and piped into the alloy pots, protecting the rods from the more economically burned heating gases. This method utilizes all of the B. T. U. value from the heating gases and still protects the surface of the treated rods from heavy scaling and surface decarburization. The result has been a product that pickles easily, draws with a smooth surface and hardens uniformly in the customer's finish heat treating operation.

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Patenting—
Three Speeds at One Time

FOR the heat treatment of spring wire and rope wire products, Youngstown has a modern patenting furnace. While of conventional design as far as heating chamber and size, its innovations in automatic temperature control, the number and position of the burners, and the winding arrangements protect the process against human errors and contribute to the uniformity of the finished product as well as to the flexibility of equipment. The patenting furnace, 50′ in length, is fired by 44 burners, divided for temperature control into three zones. The burners are placed in the vertical sides of the furnace so that no burners are directly opposite each other. The turbulence so induced and the close proximity of burners insure an exceptional degree of uniformity in the heating chamber. By turning off burners in the back the effective length of the furnace can also be shortened. The burners are of the air induction type, and motor driven butterfly valves on the air lines to the three zones regulate to the desired temperature, indicated on the governing pyrometers.

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THE winding reels are arranged in three banks of 12 each so that, if and when required, three different sizes may be run through the furnace at the same time and each still be given the proper heating time. Rod coils are spliced by butt welding. The speed of each winding section is indicated by an electric motor tachometer and the speed governed by the furnace operator in accordance with the practice specified by the metallurgical department. A lead pan at the outlet end permits both lead and air cooling at any time.

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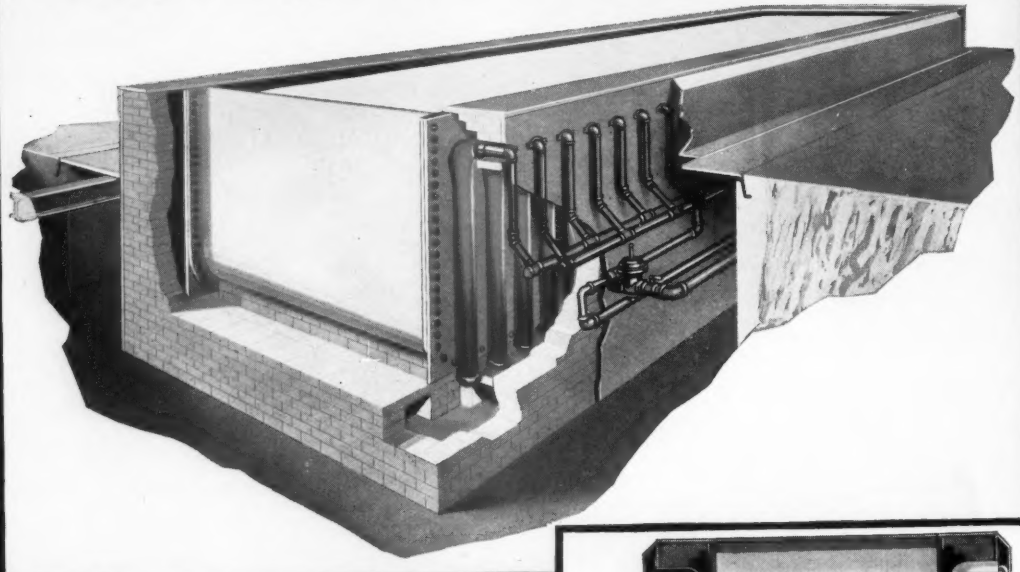
IN addition to the common uses of the patenting furnace on spring and rope wire, it has also proved valuable in the treatment of low carbon wire products where absolute uniformity of structure is

(*Please turn to page 297*)

A New Type Galvanizing Furnace

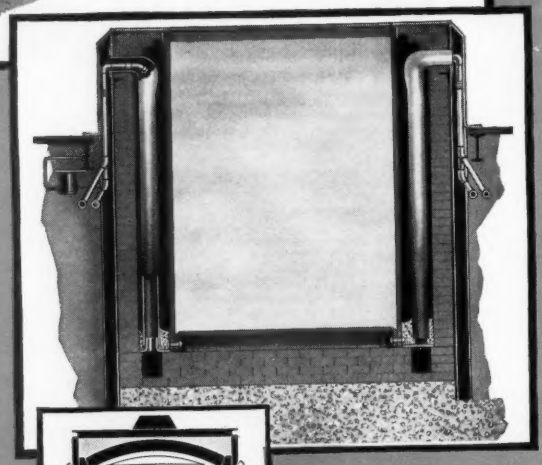


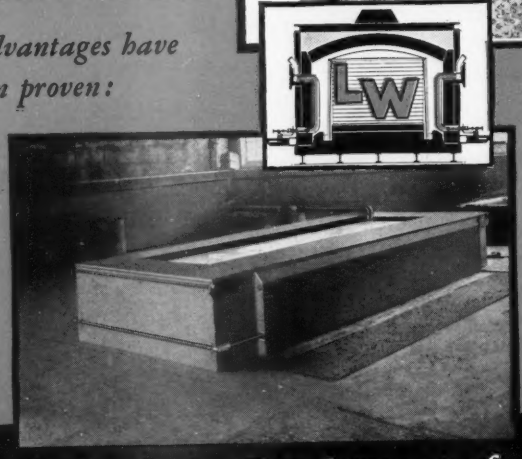
VERTICAL TUBES

THE Lee Wilson Engineering Co., who have introduced and used exclusively the vertical tube type of heating so successfully in sheet annealing operations, have adapted the vertical tube to the heating of galvanizing kettles with remarkable results.

The following advantages have already been proven:

1. No possibility of any flame impingement on kettle.
2. Perfect control of heat input from top to bottom and from end to end of sidewalls of kettle.
3. Low dross losses.
4. Longer life of kettle.
5. Lower fuel cost.
6. Availability of either gas or oil converted to gas. This is the first time oil has been used successfully.
7. Kettle can be replaced without disturbing the setting or firing equipment.
8. Due to use of up-to-date insulation and compact design, the distance from kettle sidewall to outside of setting is reduced approximately 10" over conventional impact burner type setting.





An Exclusive Development of

LEE WILSON ENGINEERING CO.

1370 Blount Street • Cleveland, Ohio

Electro-Galvanizing of Round Wire

By Arnold Weisselberg, M.E.
Consulting Engineer, New York, N. Y.

A study of the development of the electro-galvanizing of round wire together with an analysis of existing processes, effect of electro-galvanizing on the physical properties of wire, and costs. ✦ ✦ ✦ ✦ ✦ ✦

IF one inquired a few years ago about electro-galvanized round wire, he would learn to his surprise that although extensively used in Europe, this product was not being made in the U. S. The fact that flat wire, strip and pipe could be had so galvanized added to the surprise and begged the question as to why the steel mills in this country had stopped at round wire. Since then electro-galvanized wire has made its entry and within a short time has become an established staple product.

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THE history of this manufacture is mostly a record of fruitless attempts to deal with a problem which had taxed the ingenuity of the inventors. More interesting still is the fact that the cause of the difficulty was known from the earliest beginning.

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THE earliest record on the subject is the patent granted to Fox in Britain in 1879. It never attained the commercial stage, a fate in which most of the subsequent patents shared. The efforts of those engaged at that time in improving the art seemed to center around the reduction in size of the equipment. On account of the low current densities employed, the length of the tanks became prohibitive when operating anywhere near the speeds occurring in hot galvanizing. Hence the persistent attempts to electro galvanize wire by winding it on reels or drums immersed in the plating tank. This answer to the problem introduced new difficulties such as the arrangement of the anodes to insure a uniform coating. In this class belong the patents of Wallace, Lake and Rawson. By the end of the last century three methods had attained a fair measure of commercial success. Sherard Cowper Coles was forging ahead in England, Wagner in France, and Herman in Germany. In the United States a process had been developed by the U. S. Electro-Galvanizing Co., which is now the U. S. Galvaning and Plating Equipment Co. In the meantime, a number of patents had been issued on various compositions of electrolytes for zinc plating. Only very thin coatings could be obtained, fairly adhesive when great care was exercised in the manufacture. Nevertheless tests on samples produced in still baths in the laboratory held out great promises for this type of wire if only the difficulties encountered in continuous manufacture could be overcome. The English Post Office in 1894 was apparently very much impressed with the results of

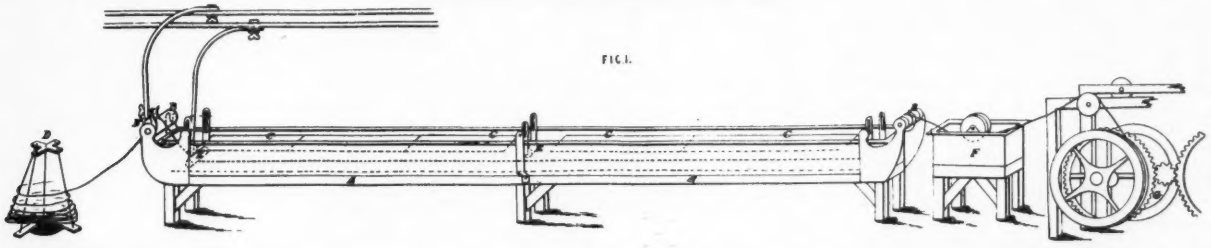

Figure 1—Drawing from British letters patent granted to Fox in 1879. First drawing on record of an electro-galvanizing plant for round wire. ✦

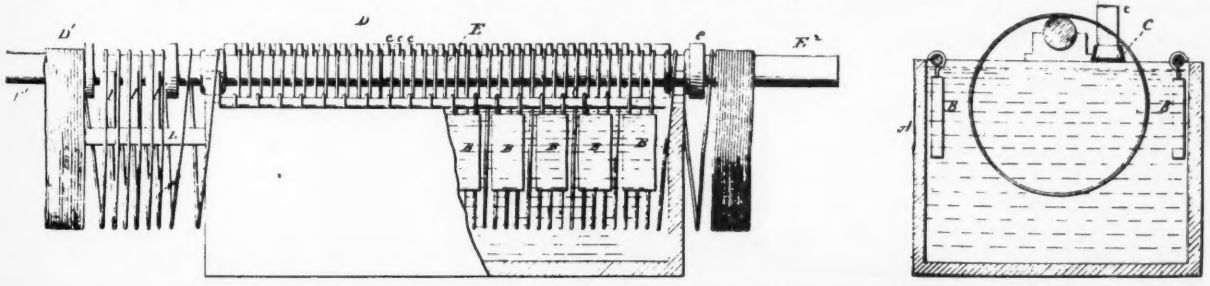

Figure 2—Drawing from British letters patent granted to Lake in 1881. This scheme is typical of attempts to reduce the size of the plant by winding the wire through the bath. ✦ ✦ ✦ ✦ ✦ ✦ ✦ ✦ ✦ ✦ ✦ ✦ ✦ ✦ ✦

laboratory tests on galvanized telegraph wire which showed that the cold galvanized wire was superior to the hot galvanized. This question of superiority of electro-galvanized coatings on wire has come up, ever since, every few years. The claim that for the same thickness the electrically deposited zinc affords greater corrosive protection, however, never went unchallenged by those who represented the hot galvanizing interests. Nor was the commercially produced product so satisfactory as to aid the cause of those who propounded electro-galvanizing. In England and the United States, the interest seemed to peter out. On the continent, however, the Herman process seemed to be making slow but definite progress. The coatings were thin, only .1 to .15 oz. per sq. ft., but they adhered well and the results were consistently uniform. The firm of G. Langbein & Co., which later became the Langbein-Pfanhauser Works, began installing one plant after another, until at the beginning of the World War, there were 35 installations in operation scattered all over Europe. By that time, coatings up to .3 oz. per sq. ft. were being obtained and the number of wires per galvanizing unit had increased to 52. Heavier coatings than .3 oz. did not appear until after the war, but the demand for heavier coatings than .5 oz. seemed limited, since the opinion prevailed that such coatings were equal to those of hot galvanized wire of twice the thickness. Several Telephone and Telegraph companies on the Continent began specifying electro-galvanized wire. Also manufacturers of wire products began showing a preference for the electro-galvanized product. Interest in electro-galvanized wire was therefore revived in England after the war and we find several firms there making heavy investments trying to develop a wire galvanizing process. Outstanding among them are Braddock of Wakefield and Hill of Cambran. All proved lamentable failures; both from a mechanical and financial point of view. In 1925 the latter plant was taken over by Whitehead, Hill and Co., who after a few years of additional development and improvement succeeded in producing a commercially saleable product. To the writer's knowledge it is still the only plant in England manufacturing electro-galvanized wire. This plant is of the single wire type using an upper and lower drum over which the wire winds.

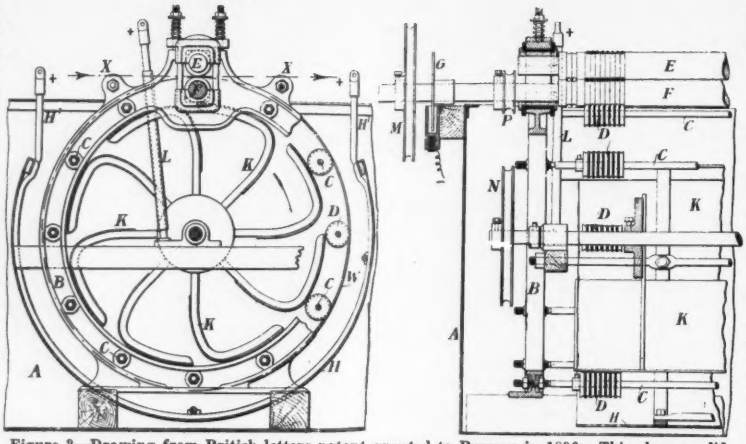

Figure 3—Drawing from British letters patent granted to Rawson in 1896. This shows a different scheme of coiling the wire in the bath in order to reduce the size of the plant.

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ON the continent the increasing demand for electro-galvanized wire resulted in the erection of more plants. By 1930, the Langbein-Pfanhauser Works completed the erection of the 50th plant. Some of these were designed to coat wire 1.0 oz. per sq. ft. but the majority of plants still continued to produce coatings of less than .5 oz. per sq. ft. The reason for this may be found in the cost. Below this weight electro-galvanized wire apparently could compete with hot galvanized wire. Above it electro-galvanized wire had to command the price of a quality product for which, however, there was only a limited market. Toward the end of the last decade, a 1.0 oz. coating was therefore considered the limit.

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Developments in the U. S.

IN the United States developments took a different course. Electro - galvanizing had been confined to flat wire and narrow strip. The thickness of the coating was limited to .3 oz. per sq. ft., and to produce such coatings by hot dipping followed by wiping would be much more expensive than electro-galvanizing. For such thin coatings, needing comparatively little adherence to the base in order to meet the requirements, the older methods of electro-galvanizing were adequate. For heavy coatings on flat wire and strip, electro-galvanizing would probably be at a disadvantage due to edge growth in plating on the one hand and the ability to produce such coatings satisfactorily and more economically by hot dipping on the other. The advantage of the electro process in providing wire screening with a thin protective zinc coating is quite obvious. It is also obvious that the hot dipping process would not be suitable for galvanizing chains. Electro-galvanized conduit piping is coated only with .3 oz. which is quite satisfactory for indoor use and stands bending much better than dipped coatings of equal thickness.

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THE test specifications that zinc coatings on round wire must meet are, however, an entirely different matter. The wrapping test on a mandrel equal the wire diameter called for a much stronger bond between coating and base than required in the case of the other products. In addition, the electro-galvanizing methods known had the fault that they deleteriously affected the physical properties of the wire, a matter of considerable import in round wire. With the advent of heavier coatings, the electro-galvanizing of wire presented an increasingly difficult problem.

THERE were repeated attempts even before the World War to produce electro-galvanized round wire, but the results were far from satisfactory and brought this product into disrepute* in this country. As recently as 1932 the writer found that a strong opinion prevailed among the majority of manufacturers and users that electro-galvanizing impairs the physical properties of the base metal especially high carbon steels, that electro-galvanized wire was too expensive to produce and that the coating could not be made to adhere well.

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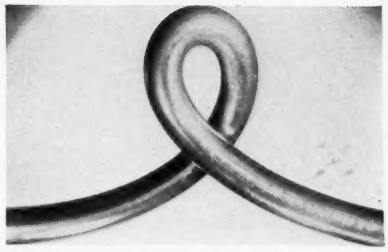
ON the other hand, hot galvanizing had undergone steady improvement. The brittleness of the ferrous zinc layer forming adjacent to the base had been reduced so that the coatings would be more ductile and adherent. In 1930, Hippensteel, Horgman and Farnsworth presented a paper entitled "Observation of the Outdoor Atmospheric Corrosion of Protective Zinc Coatings", stating that it is the weight of the zinc coatings rather than the method by which it is applied which determines the resistance to corrosion, providing it is uniform and adherent. This paper, in the writer's opinion, marked the turning point in the development of electro-galvanized wire in the U. S. At first it was detrimental to the electro-galvanizing cause, because it denied the claim that the plated coating being pure zinc is superior and resists corrosion better than hot galvanizing. Apparently all that remained to be claimed for electro-galvanizing was more uniform thickness and freedom from the heating effect of the hot spelter which made the latter unsuitable for tempered or high carbon steel wire. However, as it actually happened, this report turned out to be a boost for electro-galvanizing. The report made it quite obvious that the life of the wire would increase in the same proportion as the weight



Lustrous bright finished wire with .5 oz. per sq. ft. 5 diameters magnification. ✦ ✦

of the coatings. Assuming the mechanical and economical question solved, much heavier coatings could be produced by electro-galvanizing than possible with hot galvanizing. Coatings of 1.2 oz. per sq. ft. appear to be the limit for the latter.

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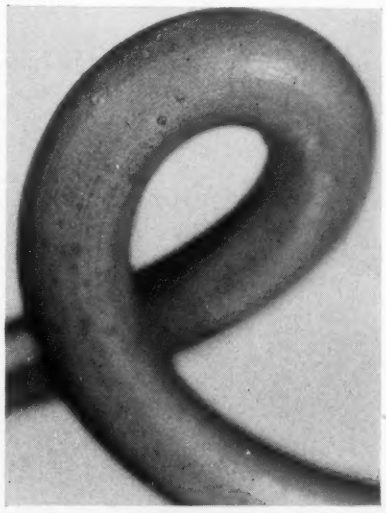
THE Bethlehem Steel Co. must be credited with the vision of a future market for electro-galvanized wire with zinc coatings heavier than producible with hot galvanizing. It was before the above mentioned report appeared that Bethlehem Steel became interested in electro-galvanized wire, influenced probably by developments in Europe. Experiments with the process invented by U. C. Tainton began in 1928. By 1932 the difficulties appear to have been ironed out and the product known as Bethanized wire was placed on the market in 1933. In Europe, too, the Langbein-Pfanhauser process had undergone some major improvement making it possible to produce heavy strongly adhering zinc coatings on a commercially economical scale. As the electro-galvanized wire is coming into wider use, new advantages are found for it and it seems a safe prediction that its application is in the ascent.



Annealed wire, 11 gage, 1.9 oz. per sq. ft. 10 diameters magnification. Note absence of cracks.

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Technical Facts and Considerations

INSUFFICIENT adherence seems to be the chief cause of the repeated setbacks and financial failures which marked the development of electro-galvanized wire. That this was due to the inadequate preparation of the wire seems to have been recognized by some from the very beginning, as revealed in an article by M. P. Wood, in the Scientific American Supplement of January 19, 1895, in which he stated that to "thoroughly clean the surface to be coated is found to be the principal difficulty in the application of any electro-chemical process for zinc." Apparently this requirement was not fully appreciated judging by the fact that subsequent efforts to improve the process centered mainly in the plating end of the process. When heavier coatings came in, it was not only necessary to find ways and means to reduce the plating time, but also to devise still better cleaning methods lest the coating should fail on test.

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THE difficulty of properly cleaning the wire will be more readily realized if one considers the following:

(1) That quite different from still plating, in a continuous process the time within which the cleaning has to be completed is very short, only a fraction of a minute in commercial operation.

(2) That the cleaning method must be of a very stable character to insure uniform results within the short time at disposal.

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IT is this last mentioned requisite that has been the despair of the experimenters. The cleaning method employed would operate satisfactorily only to break down

* In April, 1921, the Air Service Information Circular on Aviation published the results of an investigation to correct the prevailing erroneous opinion that the "wire was so embrittled by electro-galvanizing as to render it unsatisfactory for use". To the contrary it stated that "zinc plating has a tendency to increase fatigue resistance."

completely after a relative short period of operation. Many patents have been granted on the subject. Some of the methods disclosed did not prove satisfactory when put to test for conditions such as the application of heavy coatings imposes. Tainton hit upon an elegant idea for obtaining stability when he suggested to electrolytically clean the wire in a fused caustic soda and soda ash bath. The bath is kept heated in a lead pan at a temperature of more than 1200° F. The nascent metallic sodium deposited from this bath on the wire, which is made the cathode, having a high affinity for oxygen, reduces the iron oxide on the wire surface to pure iron. The sodium is thereby returned to the electrolyte. This makes for stable conditions. Practical operation proved, however, that this cleaning method need be followed by still another electrolytic cleaning method employing an acid solution to insure complete removal of all of the oxide and other impurities existing on the wire surface. Another cleaning method which has proved successful for preparing round wire, for subsequent application of heavy zinc deposits, is that developed abroad by Langbein-Pfanhauser. Information from European wire mills licensed to use this process is that it is both simple and economical in operation. The foreign patents on it only disclose an acid solution and a current density of 200 amperes per sq. ft., which makes it obvious that the principal information, on which the success of the patent hinges, has been withheld. The moderate temperatures at which it operates places it at an advantage where high carbon and spring wire are to be galvanized, although the high temperatures of the Tainton bath are not without advantage when it is desired to combine, when feasible, the cleaning with the annealing operation.

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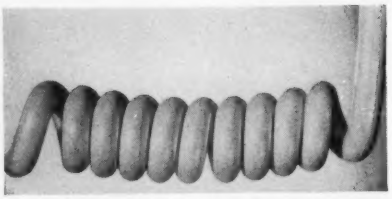
NO special method of cleaning is disclosed in the Parker Process used by Whitehead, Hall & Co., Ltd. Unsatisfactory cleaning has been the chief source of trouble at this plant. Many of the difficulties have been overcome,



No. 15 gage hard drawn, high carbon, medium bright finished .97 oz. per sq. ft. 5 diameters magnification. ✦ ✦ ✦ ✦

although it is still not regarded as suitable for high quality wires or severe cleaning conditions, if the physical properties of the wire must be preserved. Of the better known domestic electroplating engineering firms such as Hanson-Van Winkle-Muning, U. S. Galvanizing & Plating Equipment Co. and Mesher it is entirely conjectural whether they have developed a satisfactory cleaning process for round wire, in view of the absence of commercial installations using these methods.

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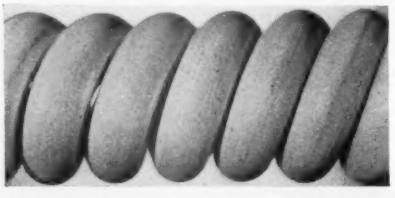
AS far as the deposition of the zinc is concerned, none of the commercial processes can lay claim to novelty of ideas. The zinc sulphate electrolyte may vary in composition from one process to another as to addition of agents with the view of improving the throwing power or brightening of the deposit, but basically they are the same. The use of lead anodes in connection with regenerative electro-zincing with recirculating electrolyte as employed in the Tainton process, in which the zinc is deposited directly from the concentrated ore dates back to 1895 as disclosed in a patent granted to Sherard Cowper Cowles. Only the method of purifying the solution has undergone substantial improvements and silver-lead anodes have been substituted for the lead anodes. The advantage of dispensing with the replacement of anodes



Showing perfect adherence of a 1.12 oz. zinc coating on a No. 8 gage hard drawn steel wire. 5 diameters magnification. ✦ ✦ ✦

is offset by the shortcoming that higher voltages (10V) must be employed than required with zinc anodes (6V). It is generally conceded that a higher voltage does not yield as tough a deposit as obtainable with a lower voltage and this is especially true with heavy deposits. Also the electrolyte must have a much higher acid concentration.

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AN outstanding fact in the new methods of electro-galvanizing of wire is the tremendous increase of the current densities. Whereas current densities of 200 A/sq. ft. were considered high a few years ago, double and triple are now customary. Only by this increase in current density could the electro-galvanizing of heavy zinc coating or wire become a commercial success. In the Tainton Process, current densities of even more than 700 A/sq. ft. are employed. The use of such high current densities makes it more difficult to obtain dense and pore free deposits. Both the heat and hydrogen liberation at such high current densities are tremendous and the tendency of formation of porous deposits is accordingly increased. One of the difficulties thus created is the more intensive washing required after galvanizing to remove the last traces of acid from the pores, otherwise corrosion will start in these pores.

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THE necessary after treatment of the wire to remove the unsightly appearance of the deposit should also be charged against the use of such high current densities.

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Effect of Electro-Galvanizing on the Physical Properties of the Wire

I HAVE already mentioned how serious the deletorious effect on the physical properties of the wire was in the older methods of galvanizing. Especially high carbon steels, in the words of a report to the English wire manufacturers "were rendered worthless". This no longer applies. A properly electro-galvanized hard drawn wire of any carbon content will have the same physical properties with respect to

torsion and bending as before galvanizing. A typical analysis is shown in table 1.

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ANNEALED wires behave differently. Age, as it is well known, has an effect on annealed wire and what causes this effect is also responsible for changes occurring in the physical properties of the wire that is electro-galvanized. Diffusion of Hydrogen into the metal is given as the cause. Quite different though from hot galvanized wire, aging of electro-galvanized wire apparently results in a partial return to its initial properties as one could conclude from the following tests, which are by no means conclusive. (See table 2).

TABLE 1

Type of Wire: #9-ga., .1 C Bessemer Steel, 1.5 oz. zn/sq. ft.	Before Galvanizing	After Galvanizing
Bending	7 7 7 6 7 5	6 7 7 6 7
Torsion	1 1 1 1 1 1	1 1 1 1 1
Tensile M#/in²	122 119	115 116
Type of Wire: #11-ga., Spring Wire, 1.01 oz. zn/sq. ft.	**Before Galvanizing**	**After Galvanizing**
Bending	6 5 5 5 5 6 5 5	5 6 5 6 5 6 6
Torsion	15 15 16 15 16	16 16 16 16 15
Tensile M#/in²	198 200	195 198

TABLE 2

Type of Wire: #14-ga. annealed, .13% C., 1 oz. zn/sq. ft.	Before galv.	After galv.	1 yr. after	4 yrs. after
Bending	12 12 16 13 12 12	13 13 11 10 12	12 11 12 11	10 10 11 12 12
Torsion	40 50 43 43 44	37 37 35 40	40 41 37 37	40 38 39 40 42
Tensile M#/in²	50.5 51 51	not tested for	62.5 62	59.5 60
Type of Wire: #12-ga. annealed, .04% C., 1 oz. zn/sq. ft.	**Before galv.**	**After galv.**	**1 yr. after**	**4 yrs. after**
Bending	22 26 25 26	19 22 22 19 21	16 19 19 13 16	14 15 16 13
Torsion	96 67 67 84 94	68 68 68 67	61 48 45 57	65 71 60 62
Tensile M#/in²	33.2 33.2	not tested for	40.4 40.4	39.2 38.6

THE increase in tensile strength over that originally possessed by the bare wire should be attributed to the zinc coating. The loss in bending and torsion property is not of the order that would meet with objections.

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Appearance and Finish of Electro-Galvanized Coatings

THE appearance of the coating as it leaves the galvanizing plant is greatly affected by the composition of the bath and the current densities employed. Under satisfactory conditions a silvery gray matt finish is obtainable which is quite pleasant to the eye. While not as bright as wiped hot galvanized wire, it is of a much more lasting nature, i. e. it will not darken like the latter will when exposed to the atmosphere. An appearance as bright as that of wiped tinned wire can be had if desired by an additional operation inserted ahead of the take up reels. Recent improvements permit of carrying out this operation without interruption from coil ends and with very little change to the wire dimensions as borne out by the following comparison before and after the brightening operation.

Cost of Electro-Galvanizing Round Wire

AS stated before, European experience taught that up to .5 oz. per sq. ft. the cost of electro-zincing came higher than for hot galvanizing and need therefore command a higher price. Since power cost makes up a great portion of the total cost of electro-galvanizing and the cost of power is much higher in Europe than on this continent this situation is well founded. With low power rates the cost may compare favorably for a four dip wire as well, especially in the heavier gauge range. For heavier coatings, of course, electro-galvanizing does not have to compete with hot galvanizing as it has the field to itself.

(*Please turn to page 290*)

TABLE 3

Kind of Wire	Ga.	Diam. Ins. Before	Diam. Ins. After	Zn. Oz./sq. ft. Before	Zn. Oz./sq. ft. After	Tensile lb./sq. in. Before	Tensile lb./sq. in. After
Bessemer hd	8	.1665	.1653	.95	.92	95,000	96,700
Bessemer Ld. An.	8	.1653	.1634	1.015	.925	64,900	66,850
Tel. Stock hd.	12	.1102	.1075	.98	.95	101,000	102,400
Tel. Stock Ld. An.	12	.1094	.1075	1.04	.995	81,600	65,400

A New Galvanizing Furnace

By W. H. Spowers, Jr.
Consulting Galvanizing Engineer
New York, N. Y.

A description of the application of vertical tube heating to galvanizing kettles with a view to maintaining a very distinct relationship between capacity and type of heat application with kettle life and dross consumption. ✦ ✦ ✦ ✦ ✦

THE latter part of 1931 the writer reported to the Wire Association, data on the first hot galvanizing kettle heated by glowing metal. This report revealed a setting fired on the deep fired principle and started on January 8th, 1931. This kettle was first drossed on April 18th, delivering 1020# of dross. It was drossed the second time on May 23rd, delivering 860# of dross. 175,822# of spelter had been consumed in five months with 1880# of dross. This is a loss of slightly over 1% in five months.

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THIS condition continued with but slight gain in dross percentage for four years when the writer advised the installation of a new pot. The kettle, when examined after removal, showed an excellent condition and exceedingly uniform breakdown and held forth the possibility of at least one year more of life. It will be understood that this installation was on continuous production, night and day the entire period given.

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A companion installation operated on the same basis but of the shallow under fired type, operated in the same five months with a yield of 21% dross and a kettle life of six months.

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THUS is proved that there is a very distinct relationship between capacity and type of heat application with kettle life and dross consumption.

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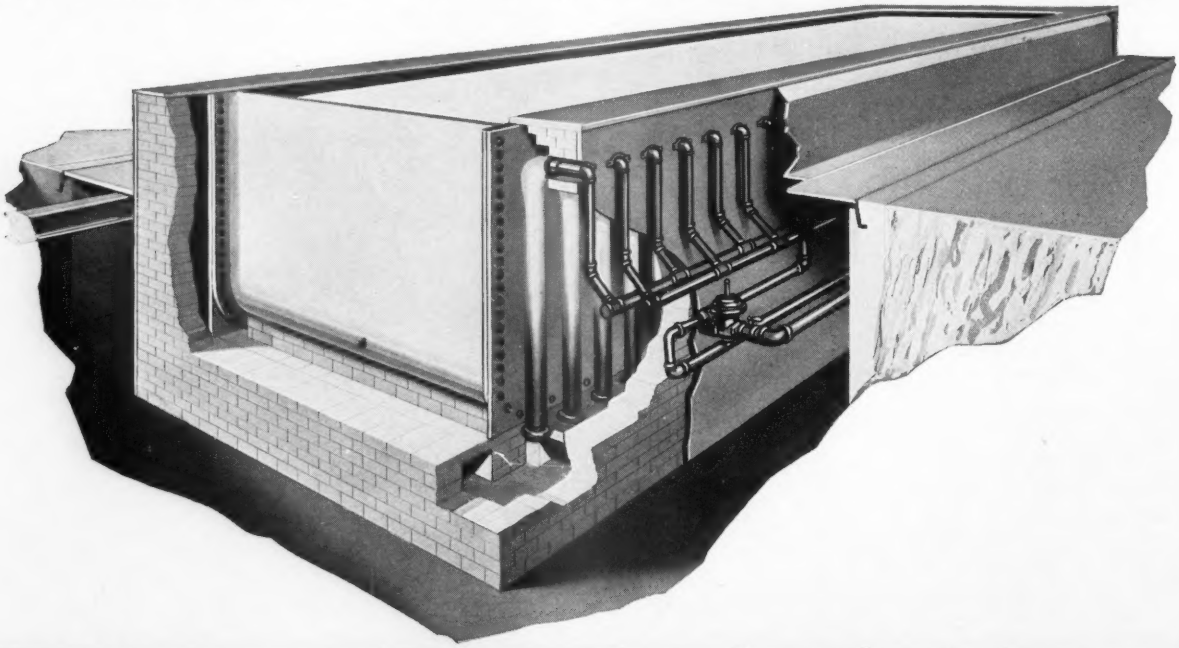
IT will be understood that this very successful and economical installation was electrically heated by glowing ribbons of such design as to offer perfect control of heat input not only from end to end of the kettle, but also from top to bottom. However, this method of heating was very uneconomical in many localities because of high fuel cost and the writer has searched continuously and experimented in adapting gas and oil to this principle. It is with great satisfaction that announcement can now be made of the perfection of this glowing heat principle to gas or oil for hot galvanizing and the complete success of the first installation.

✦ ✦ ✦

SEVERAL months ago the writer approached the Lee Wilson Engineering Company for the purpose of obtaining permission to use their patents on vertical tube heating—now so successful in sheet annealing operations—for the purpose of heating galvanizing kettles and the result of this conference was the installation of the first galvanizing kettle heated by vertical

(*Please turn to page 293*)



A Review of Recent Wire Patents

No. 2,036,393, STRANDED WIRE STRUCTURE AND PROCESS AND MACHINE FOR PRODUCING THE SAME, Patented April 7, 1936 by Arthur J. Briggs, Syracuse, N. Y., assignor to American Cable Co., Inc., a corporation of Delaware.

More specifically, the machine is adapted for fabricating stranded wire structures of the type composed of wire components laid in helical relation around a longitudinal axis, and includes means to shape the unformed stock components into the helical form they are to possess in the composite structure and means to lay the helically formed portions on a core.

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No. 2,036,425, PROCESS OF INSULATING WIRE AND PRODUCT THEREOF, Patented April 7, 1936 by Juan E. Mayoral, New York, N. Y., assignor to Driver-Harris Company, a corporation of N. J.

The wire referred to is that composed of nickel-chromium alloy and the like and the insulating layer being an adherent coating of nickel and chromium oxide, preferably having a breakdown voltage of at least five volts.

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No. 2,036,667, BIMETALLIC WIRE, Patented April 7, 1936 by Sidney D. Williams, Canton, Ohio, assignor to Copperweld Steel Company, Glassport, Pa., a corporation of Pennsylvania.

A hot-worked wire is provided comprising a steel base wire containing carbon over .10% but under .20% and manganese over 1.75% but not over 2.25% and a copper coating on the base wire.

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No. 2,037,067, METHOD AND APPARATUS FOR TREATING WOVEN WIRE FABRIC, Patented April 14, 1936 by Fred Crossman and Walter C. Sutton, Shaker Heights, Ohio, assignors to The Lindsay Wire Weaving Company, Cleveland, Ohio, a corporation of Ohio.

More specifically, this apparatus is adapted for straightening woven wire fabrics and comprises two pairs of nonrotatable straightening devices disposed in offset relationship on opposite sides of the fabric, the devices being moved so as to cause both pairs to act on the same stretch of fabric at the same time.

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No. 2,037,235, DRIVE SCREW AND METHOD OF MAKING SAME, Patented April 14, 1936 by Charles K. Hill, Cleveland, Ohio.

In the fourteen claims in this patent, several methods are set out including the manufacture of threaded-shank nails by shaping a twisted rib wire at spaced intervals to provide rounded sections adapted to be formed into heads.

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No. 2,037,271, WOVEN WIRE SCREEN, Patented April 14, 1936 by Charles A. Scheeler, Buffalo, N. Y., assignor to Buffalo Wire Works Co., Inc., Buffalo, N. Y., a corporation of New York.

Each of the warp wire strands is composed of a pair of central wires interwoven with the shoot wires parallel with one another and a side wire on each side of the pair of central wires and engaging the side of each shoot wire opposite from that engaged by the central pair of warp wires.

Complete Descriptions and Drawings of Patents May Be Had for 25 cents. Address, Wire & Wire Products, 17 East 42nd St., New York.

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No. 2,037,317, PACKING MATERIAL, Patented April 14, 1936 by Merrell Robert Fenske, State College, Pa., assignor to The Pennsylvania State College, State College, Pa., a corporation of Pennsylvania.

This inventor provides a packing material comprising small wire-like forms, comprising figures that readily interlock to form a mass which hangs together.

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No. 2,037,506, WIRE ROPE AND MACHINE FOR AND METHOD OF MAKING, Patented April 14, 1936 by Mahlon G. Ensinger, Tulsa, Okla., and Walter Voigtlander, Kansas City, Mo., assignors, by direct and mesne assignments, to American Cable Company, Inc., a corporation of Delaware.

Specifically, the apparatus is one adapted for making a wire rope structure consisting of flexible but stiff wire helices and a yieldable but radially resistant fiber-rope core.

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No. 2,037,543, ELECTRIC CABLE, Patented April 14, 1936 by Charles E. Seaberg, Bridgeport, Conn., assignor to General Electric Company, a corporation of New York.

About the wire conductor is a rubber covering with a fibrous braid upon the conductor and then a layer of paper. About this first layer of paper is a conductor wound spirally, then a second paper layer and an overall fibrous covering impregnated with a weatherproofing compound.

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No. 2,038,297, METHOD OF MAKING INDUCTIVE WINDINGS, Patented April 21, 1936 by Lyman G. Ketcham, Brooklyn, N. Y., assignor to Teleradio Engineering Corporation, New York, N. Y., a corporation of New York.

A continuous wire conductor is wound onto a core to form a self-supporting coil fixed to the core after which a second self-supporting coil is wound onto the core, the second being movable relative to the first coil so that by moving the second coil on the core until the inductance of the two coils reaches the desired value, the movable coil may be secured to the core in the adjusted position.

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No. 2,038,377-78, ELECTRICAL CABLE, Patented April 21, 1936 by Carl F. Obermaier, York, Pa., and Murray H. Owen, Stratford, Conn.. assignors to General Electric Company, a corporation of New York.

The first of these patents covers a cable having a wire conductor with insulation therefor comprising layers of regenerated cellulose in sheet form and felted asbestos superposed directly on the conductor, while the second patent covers the insulating material itself.

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No. 2,038,542, BOLT MACHINE, Patented April 28, 1936 by Michael J. Riley, Cleveland, Ohio, assignor to The National Machinery Company, Tiffin, Ohio, a corporation of Ohio.

In this bolt machine, extruding, trimming, cutting and thread forming in the manufacture of bolts is carried out.

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No. 2,038,548-49, METHOD OF COATING METAL, Patented April 28, 1936 by Elgin Carleton Domm, Niles, Mich., assignor to National-Standard Company, Niles, Mich., a corporation of Michigan.

In the first method, the iron wire is coated by applying to it by the hot-dip process a coating of cadmium and then electrodepositing thereon an outer coating wholly of zinc. In the second method, after the wire is coated with cadmium, the same metal is electrodeposited thereon as an outer coating.

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No. 2,038,550-51, METHOD OF ELECTROPLATING CADMIUM ON CADMIUM-ZINC ALLOYS, Patented April 28, 1936 by Elgin Carleton Domm, Niles, Mich., assignor to National-Standard Company, Niles, Mich., a corporation of Michigan.

According to the first method, the iron wire is coated, by the hot-dip process, with an alloy of cadmium and zinc, and then an outer coating of cadmium is electrodeposited thereon. In the last patent, the iron wire is coated as before with an alloy of cadmium and zinc and then a coating of zinc is electrodeposited thereon.

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No. 2,038,718, SPRING STRUCTURE, Patented April 28, 1936 by William A. Clark, Detroit, Mich., assignor to L. A. Young Spring and Wire Corporation, Detroit, Mich.

More specifically, the spring structure is one provided with an open bottom with an open or skeleton base formed of rigid, although comparatively light, material.

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No. 2,038,894, HIGH TENSION ELECTRIC CABLE, Patented April 28, 1936 by William A. Del Mar, Greenwich, Conn., assignor to Habirshaw Cable & Wire Corporation, New York, N. Y., a corporation of New York.

About the wire conductor is an envelope of oil-pervious insulating material, then a layer of oil impervious material dividing the insulating material envelope into two layers, after which there is an impregnation of viscous oil on the less highly stressed side of the impervious layer and an impregnation of thin oil on the more highly stressed side of the layer.

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No. 2,038,934, MULTICORE ELECTRIC CABLE, Patented April 28, 1936 by Philip Vassar Hunter, London, John Francis Watson, Abbey Wood, and Leslie Giddens Brazier, London, England,

(*Please turn to Page 299*)

Exports and Imports of Wire

Exports of Iron and Steel Wire Products in Mar., 1936 and Mar., 1935
(In gross tons)

	Mar. 1936	Feb. 1936	Mar. 1935
Wire rods	4,042	1,786	1,354
Hoops, bands and strip steel	4,604	4,367	4,689
Plain black or galvanized iron or steel wire	4,547	1,922	3,450
Barbed wire and woven wire fencing	2,861	2,524	2,622
Woven wire screen cloth	85	74	97
Wire rope	208	183	524
Insulated iron or steel wire and cable—see analysis below			
Other wire and manufactures	409	488	590
Wire Nails	569	674	1,270
Tacks	31	15	44
Other nails, including staples	162	167	226
Bolts, machine screws, nuts, rivets and washers	540	448	665
Total, these 11 classifications	18,058	12,648	15,531

Imports of Iron and Steel Wire Into the United States
(In gross tons)

Concrete reinforcement bars	86	107	92
Hollow bars and drill steel	134	130	50
Wire rods	1,039	2,192	1,881
Barbed wire	2,032	1,885	3,398
Round iron and steel wire	331	425	330
Telephone and telegraph wire	26	1	4
Flat wire and strip steel	218	234	152
Wire rope and strand	268	173	204
Other wire	143	164	70
Hoops and bands	1,765	1,278	1,526
Nails, tacks and staples	2,604	2,611	1,339
Bolts, nuts and rivets	15	70	28
Total, these 12 classifications	8,661	9,270	9,074

Exports of Insulated Wire and Cable, March, 1936

	Foreign		To U. S. Possessions	
	Pounds	Dollars	Pounds	Dollars
Insulated iron or steel wire and cable	2,184	$ 976	.....	$ .....
Rubber-covered wire	341,829	71,051	96,001	17,947
Copper weatherproof wire	90,877	13,762	114,180	19,410
Copper telephone cable	16,399	5,215	41	45
Other insulated copper wire	423,596	77,316	97,506	16,996
Nickel-chrome electric resistance wire	23,895	34,339	783	894
Total, these 6 classifications	898,780	$202,659	308,511	$55,292

March Exports of Semi-Finished and Finished Iron and Steel Products Increase Sharply Imports Also Up

SHIPMENTS of semi-finished and finished iron and steel products from the United States during March (96,884 gross tons) gained (26.2 percent) when compared with those made in the previous month. This total also exceeded (7.5 percent) that for the corresponding month of 1935, and was higher than that registered in any other month for a considerable length of time.

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OUTSTANDING features in the trade during March were the healthy gains registered in shipments of tin plate, black steel sheets, heavy rails, wire rods and fabricated structural shapes.

EXPORTS of scrap (iron and steel, ton plate, and waste-waste tin plate) aggregated 167,-453 tons during March, which was an increase (15.5 percent) when compared with February shipments but sharply below (28 percent) the total for the corresponding month of 1935.

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IMPORTS of semi-finished and finished items during March (49,728 tons)—after following a downward trend since November 1935,—veered upward and registered a sharp gain (39 percent) when compared with the total for February and was considerably ahead (160 percent) of the trade during the corresponding month of 1935.

Exports

TIN plate maintained its rank as the leading product exported from the United States within the semi-finished and finished group, the total of 23,444 tons being widely distributed, the chief outlets being Brazil (2,228), Soviet Russia (1,908), Argentina (1,798), China (1,667), Uruguay (1,586), British Malaya (1,428), and Japan (1,179). Next came black steel sheets shipped to a total of 14,538 tons, the larger shipments going to Soviet Russia (4,580), Canada (3,688), Australia (1,707), Mexico (771), Brazil (757), and the Philippine Islands (752). Heavy rails (7,750 tons) was the third product of importance, the bulk of which being shipped to China (2,537), Costa Rica (2,096), Brazil (1,427), Panama (806), and Chile (688). 'Other plate' (4,494 tons), ranked next and was distributed chiefly to Canada (1,198), Mozambique (840), Netherland India (694), and the Union of South Africa (348). Wire rods were shipped to a total of 4,042 tons, and for the most part went to Japan (2,121), Turkey (1,297), the Netherlands (257), and the United Kingdom (240). Plain shapes (3,840 tons) made up the sixth product of importance in the month's trade, and was chiefly taken by Canada (2,316), the Philippine Islands (342), and Brazil (272).

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Canada Continues to be Outstanding Purchaser

EXPORTS to Canada (17,607 tons) were made up largely of black steel sheets (3,688) plain shapes (2,316), strip steel, hot rolled (1,731), 'other steel bars' (1,490), tin plate (1,456), 'other plate' (1,198), and strip steel, cold rolled (1,108). Soviet Russia (the second market) purchased to the extent of 8,604 tons with black steel sheets (4,580), tin plate (1,-908), strip steel, cold rolled (1,-052), and 'other steel bars' (498) predominating. Next was Brazil with a total trade amounting to 7,512 tons in which tin plate (2,-228), heavy rails (1,427), black steel sheets (757), plain shapes (272), and galvanized steel sheets

(258) were outstanding. China's purchases (5,946 tons) were mostly of heavy rails (2,538), tin plate (1,667), black steel sheets (683), rail joints, splice bars, etc., (209), and 'other steel bars' (190). Following came the Philippine Islands whose trade (5,837 tons) was made up chiefly of galvanized steel sheets (1,053), fabricated shapes (867), black steel sheets (752), tin plate (552), 'other steel bars' (543), and sheet piling (415). Mexico was the sixth market of importance with purchases totaling 4,056 tons, the principal items being tin plate (822), black steel sheets (771), cast-iron pressure pipe and fittings (326), galvanized steel sheets (161), black steel welded pipe (135), and 'other plate' (122).

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Imports

AN abrupt halt in the downward movement of semi-finished and finished iron and steel imports (since November, 1935) occurred in March when the trade totaled 49,728 tons to register 39 percent higher than February receipts and 160 percent more than that during the corresponding month of 1935.

✦ ✦ ✦

PIG iron—within the semi-finished and finished group—maintained its role as the leading iron and steel import item, the total of 23,743 tons coming mostly from the Netherlands (15,029), British India (4,503), and Soviet Russia (2,551). Structural shapes (4,447 tons)—the next item of importance—came chiefly from Belgium (3,802), France (1,150), and Germany (216). Bars, whether solid or hollow, (3,844 tons) were purchased principally from Belgium (2,063), France (909), Sweden (488), and Germany (288). Nails, tacks, and staples (2,604 tons) were sent in for the most part by Germany (2,429), and Belgium (164). Next was ferromanganese (2,345 tons) originating mostly in Norway (1,118), the United Kingdom (478), the Netherlands (351), and Poland and Danzig (238). The sixth product was 'other pipe' (2,126 tons), the outstanding suppliers being Germany (1,499), Poland and Danzig (320), and Sweden (288).

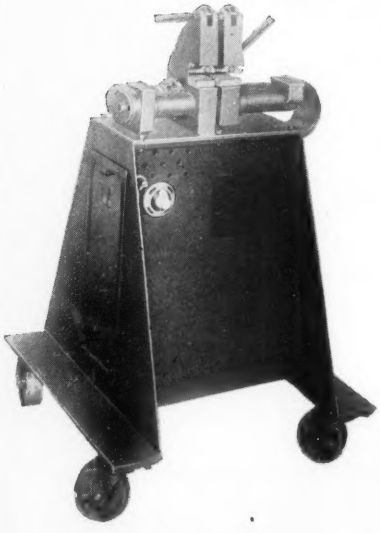
✦ ✦ ✦

Sources of Iron and Steel Imports Into the United States

THE Netherlands—by reason of increased pig iron shipments—was the leading supplier of iron and steel products (within the semi-finished and finished group) to the United States during March. Its trade (15,404 tons) was mostly of pig iron (15,024), and ferromanganese (351). Germany's more varied trade (8,260 tons) was next, and was made up chiefly of nails, tacks, and staples (2,429), barbed wire (1,969), 'other pipe' (1,499), and welded pipe (458). Belgium's rather widespread trade (8,266 tons) followed, and the bulk of it was made up of shapes (3,082), bars, whether solid or hollow (2,063) sheets, skelp, and sawplate (1,265), and 'other hoops' (1,234). British India's trade

(*Please turn to page 302*)

MICROMETER PRECISION MICRO-WELD TRADE MARK REG. U. S. PAT. OFF.



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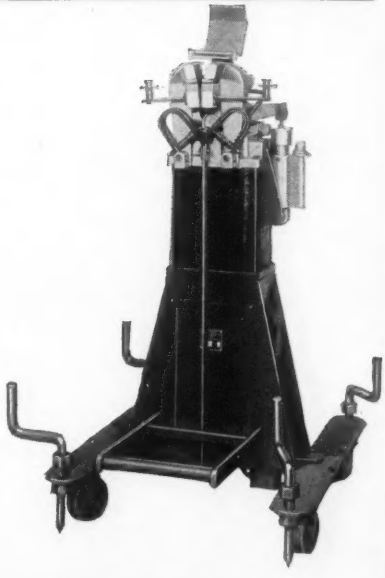

MICRO PRODUCTS COMPANY

20 NORTH WACKER DRIVE, CHICAGO, ILL.

Telephone State 7468 General Office and Factory, Peoria, Ills.

Electro-Galvanizing of Round Wire

(*Continued from page 285*)

THE cost will obviously vary with the production, the wire gauge and thickness of deposit. An idea as to these costs, though, for galvanizing from anode may be gained from the following table for 12 Ga. wire with .6 oz. and 1. oz. deposit, based on 25 tons actual production in 24 hours.

✦ ✦ ✦

THESE cost figures show to what extent the cost of power influences the total cost. As the cathode efficiency for zinc is 100% and the zinc losses negligible (as only that is wasted which is lost through drag out from the solution), the power for plating and the zinc requirements can be accurately determined and are the same for all methods.

COST figures have a way of obscuring intangible gains and therefore the advantages of electro-galvanizing of round wire are summed up:

✦ ✦ ✦

Operation Advantages

(1) The zinc economy is maximum. There are no zinc losses.

(2) There are no losses during shut down.

(3) The plant can be started up and shut down quickly.

(4) The thickness of the coating can be accurately controlled.

(5) The operation of the plant is clean, pleasant and not health impairing.

Quality Advantages

(1) The coating is very uniform in thickness.

(2) Coating of more than 4 dips can be produced. Due to uniformity of coatings .2 oz. per sq. ft. can be allowed for 1 dip.

(3) Does not affect physical properties of the wire. Suitable for spring steel.

(4) The coating of pure zinc is highly ductil and adheres perfectly so that it will neither peel nor crack when wrapped around its own diameter.

(5) The coating surface is smooth, an advantage in fabrication.

(6) Defects of the wire are revealed.

TABLE 4

	0.6 oz./sq. ft	1 oz./sq. ft
Power (including drives) @ 5 mills per KWH	$35.	50.
Zinc @ 6c per lb.	105.	174.
Labor @ 65c per MHr.	68.	78.
Chemicals, steam & water, maintenance & repair, pickling included	42.	48.
Total	250.	350.
Per Ton net bare wire	10.	14.
Per Ton galvanized wire	9.70	13.15

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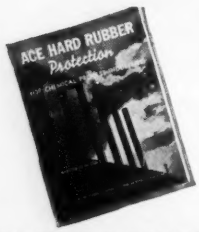

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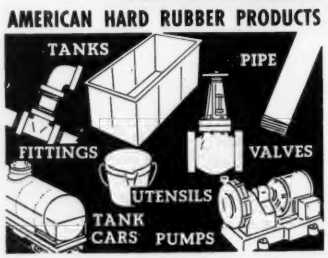

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'Round the World With the Wire Industry

German Notes

THE Stahldrahtverband, which unites the German manufacturers of steel wires of high quality (wire for wire rope manufacture, high tensile wire, wire for mesh manufacture, etc.), reports that the total turnover of the cartel members had been 63,337 tons in 1933; 71,946 tons in 1934 and 81,397 tons last year. The turnover this year shows a further tendency to rise. Of the total, 22,257 tons for wire rope production and strand wire were exported as were 6,664 tons of other special wire products, which is 15% better than 1934. The demand for bicycle spike wire is particularly good and is included in these figures. Great Britain is buying more as are Japan and the Far East.

✦ ✦ ✦

THE fact that British India has abolished the 10% preference import duty on British materials (Ottawa preference) will have no influence on standard wire sales to India, because the market has been divided between both industries. However, it will have a considerable influence upon exports of wire mesh, wire rope and other special wire products as well as non-ferrous metal wires. Already inquiries for these products have shown a rather sharp increase.

✦ ✦ ✦

IN investigating the Japanese wire competition, it is pointed out that Japan's exports of 40,000 tons of wire products last year, compared with 32,000 tons in 1934, are not as important a competition as it looks. Of the 40,000 tons, not less than 22,000 tons went to Kwantunfi Manchukuo and Formosa; of the remaining 18,000 tons, the Japanese Mandated Territories in the South Seas and the Japanese settlements in China took 1700 tons, so that the total quantity sold for the open market were 16,300 tons whereas in 1934 the quantity was 20,800 tons. The Japanese competition, however, is now much keener in galvanized wire, barbed wire and annealed wire than before, whereas the pressure is less keen in wire nails and similar products.

✦ ✦ ✦

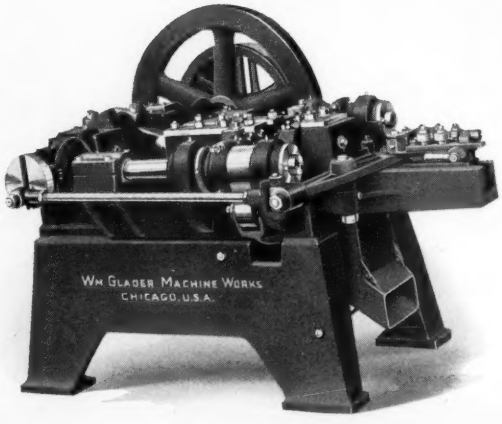
THE fact that American wire prices have been increased for annealed, bright and galvanized, whereas prices for nails, barbed wire and netting were reduced, has brought a decline in orders for these products, but orders for bright and other wire show a sharp increase, particularly from such American manufacturers who are faced with the problem of having to pay prices for semi-finished products for manufacturing which are more expensive than the price for the finished product itself. The purchases from American manufacturers for these wire products have been placed chiefly through New York agencies.

✦ ✦ ✦

THE general tendency on the export market is satisfactory and the market has recovered from the lull in March. Latin America

(*Please turn to page 292*)

Again The Exclusive Selection



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Wm. Glader Machine Works

210 N. Racine Ave., Chicago, Illinois

'Round the World With the Wire Industry

(*Continued from page 291*)

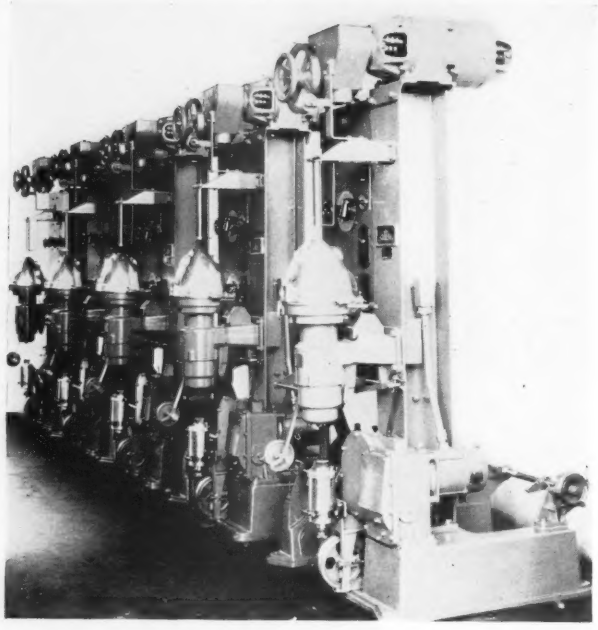
and South Africa have both placed important orders. The Far East is still quiet, but Europe is buying more, particularly Great Britain where prices have again been advanced. Wire netting is in demand. This concerns nearly all markets.

✦ ✦ ✦

GERMAN wire nail exports for the first quarter of this year aggregated to 12,822 tons as compared with 8,118 tons same time last year.

Firm Recently Incorporated in Canada to Produce Ferro-Silicon

ST. Lawrence Alloys, Limited, Beauharnois, Quebec, Canada, has been recently incorporated to produce ferro-alloys (by the hydro-electric process). Construction work on a $100,000 plant for the production of ferro-silicon (45 percent and up), high and low grades of ferro-manganese and silico manganese was expected to begin about May 1.



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Steel Wire Cartel Maintains Usual Production Schedule During First Quarter

PRODUCTION was maintained at 375,000 metric tons by the **International** Steel Wire Cartel, during the first quarter of 1936. The problem raised by two Belgian and one French producer (to increase production) is said to have been solved.

✦ ✦ ✦

L. A. Young Spring & Wire To Open New Plant In Los Angeles

L. A. Young Spring & Wire Corporation has bought a new plant in Los Angeles, and will put it into operation in the near future, L. A. Young, president, told stockholders at annual meeting.

✦ ✦ ✦

THE new plant is designed particularly to handle cushion spring business for automobile assembly plants in the Los Angeles area, but also will make bed springs, coat hangers and other products manufactured by the company.

✦ ✦ ✦

Republic Steel To Erect New Building For Heat-Treating

IT is reported that Republic Steel Corporation is starting to erect a new building for a heat-treating furnace with all necessary auxiliary equipment, at its Lansingville plant in Youngstown. The addition is in connection with the company's tube mills. This improvement and others under way at Lansingville will involve expenditure of $560,000 and will be completed in three months. A large number of men is employed in construction, but a comparatively small number will be required to operate the furnace, which is entirely mechanized.

✦ ✦ ✦

"THE new furnace will be used to make deep well casing, which must be of very strong steel, free of stresses," states C. H. Elliott, manager of the Youngstown district. A new building to house the furnace with conveyors, cranes and all other equipment, will be constructed.

✦ ✦ ✦

(*Please turn to page 299*)

A New Galvanizing Furnace

(*Continued from page 286*)

alloy tubes heated from the inside by gas and applying to the side walls of the galvanizing kettle heat given off by the glowing tubes.

✦ ✦ ✦

THE feature of this installation is the system of heating which consists of a series of vertical tubes located inside the furnace walls. Gas burners fire into the upper ends of the tubes and the hot products of combustion exit from the lower. The vertical portions of the tubes are heated and the heat is radiated into the interior of the furnace.

✦ ✦ ✦

ONE reason for the success of this type of firing is that the vertical heating element allows the fuel to be burned in the upper section of the tube so that a large portion of the heat liberated is radiated to the upper portion of the kettle where it is most needed.

✦ ✦ ✦

THESE vertical hot tubes are located within the brickwork of the furnace along the side walls of the kettle at any intervals necessary according to the tonnage and capacity of the kettle. The hot tubes are of chrome-nickel alloy and are all alike, each being approximately four inches in diameter and equal in height to the depth of the kettle with a solid cast elbow at the top welded into the sleeve. The gas burners are of the blast type and fire into the upper ends of the tubes.

✦ ✦ ✦

A NEW principle in effecting great efficiency in tube type heating is the application of refractory "core busters", a feature developed by the Lee Wilson Engineering Company. These are star shaped baffles, several of which are inserted within each tube to form a chain, from the lower portion of the tube to a point about half way to the elbow. The dual effect of these core busters is to cause the hot products of combustion to scour the tube, thereby giving up the maximum amount of heat and at the same time they become incandescent so that considerable additional heat is forced through the tube by radiation.

(*Please turn to page 300*)

TURN YOUR TROUBLES OVER TO

SAMSON SPRING WIRE
KEYSTONE STEEL & WIRE CO. PEORIA, ILL.

KEYSTONE

Are your production schedules delayed because the quality of the wire you received is not the quality you ordered? Is lack of uniformity causing slow-ups, increasing die costs, creating fabricating difficulties?

Or — are you developing new wire products and are not exactly sure what type wire is best adapted for most economical, profitable production?

Turn your worries over to KEYSTONE. The chances are we can offer helpful suggestions. Working thru the years, with a varied class of wire converters, has taught us many short-cuts. When do you want to talk about it?

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OR
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Bright
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Waterbury stand spooler for fine wire.

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Five-block rod bench with gear drive and motor, 26″ and 22″ blocks.

No. 400
Twenty head enameling machine complete, capacity down to .001.

No. 401
Eight head spooler, capacity 200 lb. spools, motor driven.

No. 402
Hayes electric furnaces, automatic control, with 32 head spooler, for fine wire.

No. 403
Waterbury straight roll fine wire machines, motor and belt drive.

No. 408
Barron and Crowther 3 hole continuous wire machines, ranges from No. 5 rod to 21 gauge.

No. 432
24 block intermediate frame with 16″ blocks, reducer, and pulley drive.

No. 441
Vertical Olsen tensile testing machines, 10,000

No. 445
Five-head S. & H. florist wire machine.

No. 456
Tinning equipment:
10 and 20 block fine wire units, 8″ block.
8 block unit for 16″ and 22″ blocks.

No. 459
Shuster straightening and cutting machine for ⅝ round.

No. 460
120 National Nail machines, 2D to 60 D.

No. 461
15 Lambert Cut Nail machines 4 D to 10 D.

No. 464
9 Emery Barb Wire Machines, 2 and 4 point.

No. 465
Am. Hard Rubber Acid Pump, Model B-244, 2″ x 4″.

No. 469
Two and four blocks heavy rod benches with motors and drives.

No. 470
24-carrier single deck textile 4″ braiders.

WE HAVE BUYERS FOR THE FOLLOWING

No. 448
7-wire planetary closing machine for 24″ reels.

No. 453
1 single head ripping machine for tungsten carbide dies.

No. 454
Vaughn Motobloc for ¾″ steel.

No. 457
Diamond die polishing machines
1 for .080
2 for .050
3 for .025

No. 458
Equipment for manufacturing Tungsten and Molybdenum wire, press and dies, slug treating, swaging, drawing and spooling machines.

No. 468
Machine for straightening and cutting narrow flats.
Slitter for 16 ga. up to 20″ wide.
Roll flattener for strips ⅛″ thick up to 20″ wide.
Machine for round edging narrow flats.

No. 472
Turks heads, 3 U, 4 U, 5 U, without rolls.

No. 473
Electro galvanizing machine for screen cloth.

No. 474
Calender rolls for Wire Cloth 8 to 12″ dia. rolls, 36″ length.

No. 475
Bull blocks for ⅝″ steel.

No. 476
Heavy rod bench 3 to 5 blocks all above floor, preferably Morgan.

No. 477
Small Watson Stillman solder extrusion press.

No. 478
Larmuth type stranding machines, 7 and 12 spool, equivalent of N. E. Butt S-25-29-30.

No. 479
Single and double cotton serving machines.

No. 480
24-spindle cotton winding equipment, 4 and 6 inch traverse.

No. 481
3-head strip machines, 6″ and 9″ cutter size.

No. 482
Wax saturating and finishing tanks, small and medium, gas heated drum type.

No. 483
Stringing machines, one for rods up to 3-8, one for No. 4 to No. 12 wire.

No. 484
Shuster machine for ¼″ maximum.

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Outstanding Personalities of the Wire Industry

Frank Mossberg Celebrates Golden Wedding

THE many friends of FRANK MOSSBERG, President of the Mossberg Pressed Steel Corp., Attleboro, Mass., will be interested to know that he celebrated his fiftieth wedding anniversary on April 22nd at Attleboro, Mass.

✦ ✦ ✦

FOR many hours, friends and well wishers crowded flower banked rooms to extend good wishes; cablegrams and telegrams flowed unceasingly and from a dozen Massachusetts towns scores of guests called to extend their congratulations.

✦ ✦ ✦

E. F. Entwisle, Assistant General Manager Lackawanna Plant, Bethlehem Steel Co.

E. F. Entwisle, formerly superintendent of the Saucon division of the Bethlehem plant, has been appointed assistant general manager of the Lackawanna Plant. Mr. Entwisle was graduated from Cornell University in 1906 and entered the employ of the Bethlehem Steel Company at the Sparrows Point, Maryland, plant as mechanical engineer in 1914.

✦ ✦ ✦

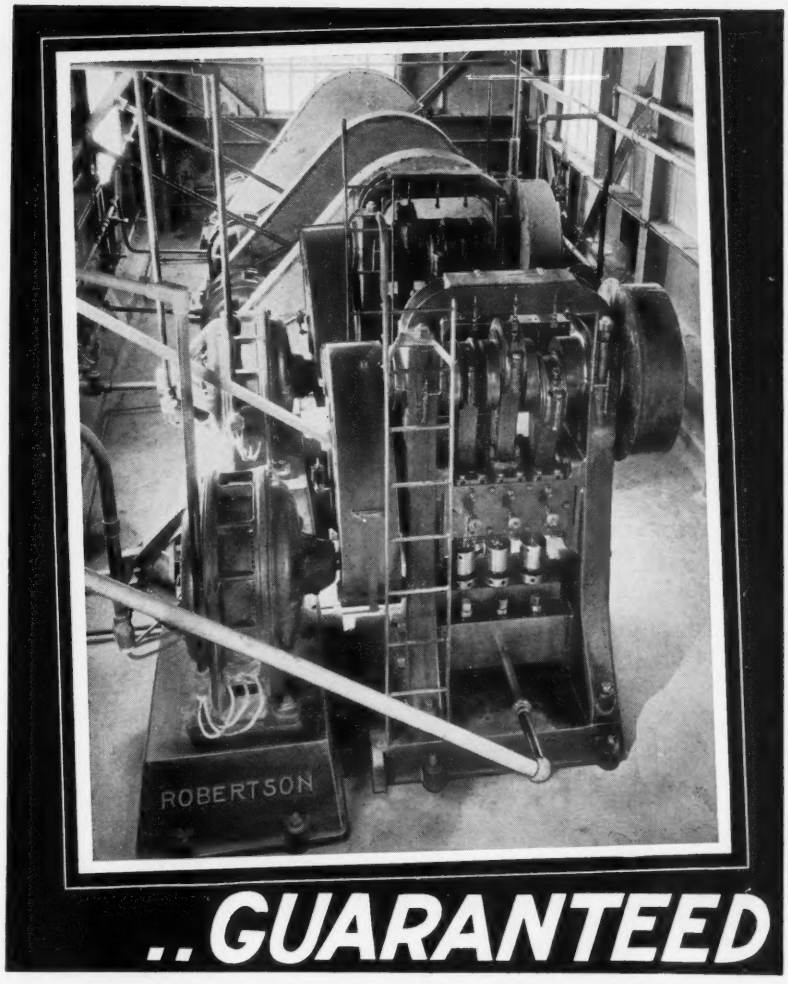
HE later became successively mechanical engineer at the Steelton plant, general superintendent of the then blast furnace division of the Lebanon plant, and later assistant general manager of the Steelton plant. He became superintendent of the Saucon division in 1928. He has been succeeded as superintendent of the Saucon division by V. J. Pazzetti, formerly superintendent of open hearth No. 2 in this division.

✦ ✦ ✦

Alexander E. Walker, General Sales Manager, Republic Steel Corp.

ALEXANDER E. Walker, sales manager for Republic Steel Corp. of Cleveland, Ohio, has been elected president of the Truscon Steel Co., Youngstown, Ohio, and

(*Please turn to page 296*)



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By

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THE publication of the first edition of "Wire Drawing and the Cold Working of Steel" occurred over ten years ago, but in this age of technical development the progress made is so rapid that such a period is sufficiently lengthy to make any text-book out of date, and in the preparation of the second edition of this valuable work the author has not been so much surprised that much has had to be revised, or rewritten, as that any of the text could be left without modification.

✦ ✦ ✦

THE main scheme of the original edition has been retained with its intention of so presenting the subject that it may be of interest to both the wire manufacturer and the wire user. Some matter has been eliminated, but much has been added, notably an entirely new chapter dealing with typical applications of wire; and although some of the old text remains unaltered, every chapter has been completely revised and several entirely rewritten. The volume has also been re-illustrated with a large number of photographs, diagrams and tables. Thus has been brought fully up to date the author's intention to explain the real nature of cold-worked products, and to show how the physical properties required for a particular process may be obtained.

✦ ✦ ✦

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Outstanding Personalities of the Wire Industry

(*Continued from page 295*)

will also continue as Republic's general sales manager. Mr. Walker succeeds **Julius Kahn,** who is now vice president in charge of product development for Republic.

✦ ✦ ✦

MR. Walker was graduated from the University of Michigan in 1910 with an engineering degree. He was with the LaBelle Iron Works, Steubenville, O., now a part of the Wheeling Steel Corp., both at the works and in the Chicago office for over four years.

✦ ✦ ✦

IN 1916 he went with the Republic Iron and Steel Co., Youngstown, O., in the pipe division, and in 1919 was named assistant general manager of sales for Republic. He became general manager of sales in 1928 upon the resignation of W. B. Topping, whose assistant he had been.

✦ ✦ ✦

E. J. Hanley New Secretary of Allegheny Steel

THE appointment of **Edward J. Hanley,** assistant superintendent of the wire and cable department of the Schenectady Works of the General Electric Company, as secretary of the Allegheny Steel Company has been announced, effective upon his reporting for his new duties at Brackenridge, Pa., on May 25, 1936.

✦ ✦ ✦

MR. Hanley, a native of Whitman, Mass., was graduated from Phillips Andover Academy in 1920 and obtained a B. S. from Massachusetts Institute of Technology in 1924, and in 1927 a master's degree in business administration from the Harvard graduate school of business. He is a member of Tau Beta Pi, engineering fraternity.

✦ ✦ ✦

MR. Hanley entered the employ of General Electric in 1927 as a member of the factory training course, and the following year was transferred to the staff of the Schenectady works accountant. In 1931 he became assistant to the auditor of works accounts, and in 1934 was appointed to his position in the wire and cable department.

(*Please turn to page 304*)

Fig. 13—Wire products which require wire meeting the most rigid specifications.

✦ ✦ ✦ ✦ ✦ ✦ ✦

Keeping Pace With Progress

(*Continued from page 279*)

a prerequisite to satisfactory performance.

✦ ✦ ✦

Wire Products Departments

TO round out facilities for handling the entire product of the rod mills, the Youngstown plant has a wire galvanizing department, a nail mill with 196 machines, a twisted strand barbed wire department and a straightening and cutting department.

✦ ✦ ✦

Control in Galvanizing

THE wire galvanizing department has two units, one for the production of charcoal wiped or double galvanized wire, and the other for asbestos wiped or single galvanized wire. Both are equipped with lead annealing units ahead of the zinc pans with automatic temperature control to insure uniformity of temper in the finished wire. Users of galvanized wire for forming operations soon discover the advantages this careful control of physical properties gives.

✦ ✦ ✦

The Nail Mill

THE nail mill, with a variety of nail making machines, is prepared to make almost any nail desired by the customer. Twisted strand barbed wire and twisted splice hoops are two of the company's merchant products. Facilities for straightened and cut wire are provided by ten machines of the spinning die type.

✦ ✦ ✦

Straight Line Operations

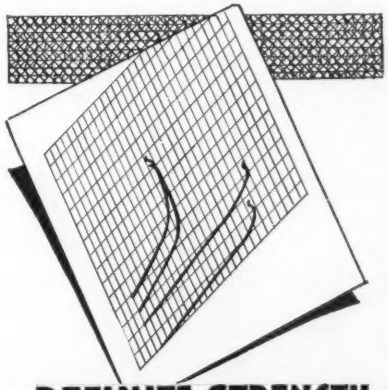
WITH the physical equipment as outlined in the previous paragraphs of this article, the production department has attempted to arrange for straight line operations. Material for the wire mill does not back-track from the time it leaves the billet dock until it goes out as finished wire. Wherever possible hoists have been provided to eliminate manual lifting of any kind, in the processing operations of this mill. Intelligence and initiative have replaced muscle as the prime prerequisites for a job in the rod and wire mill.

✦ ✦ ✦

Written Schedules of Operation

THE production department guards against mistakes in judgment or interpretation of the information on the customer's orders by issuing a written schedule for the operation of each department in the mill. These written schedules specify the customer's name, the order number, the weight required, the chemical specification, the inside diameter of the finished coil, the coil weight, the size of the wire or rod, the size tolerance allowed by the customer, the type of finish desired, the method of bundling, and the date on which the order must be shipped. This information is all indexed for future reference.

(*Please turn to page 298*)



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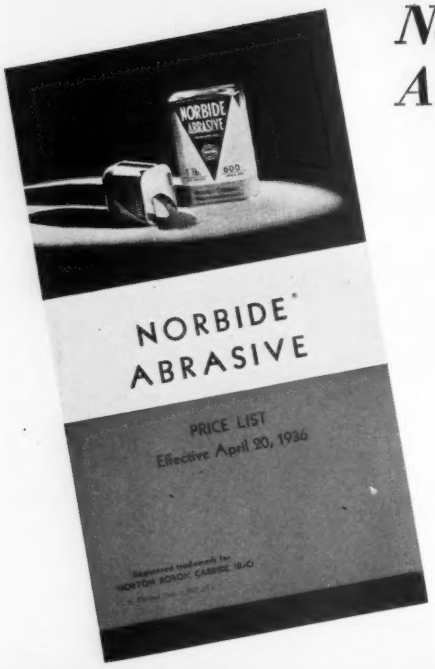

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MADE of rust and corrosion-resisting alloyed steel and not to be compared with the inferior vulcanizing pans that are commonly used. Electrically welded into a homogeneous unit. Perfectly balanced. May be lifted by center hook that is welded to cross members. Made in any size with or without cover.

Send for Catalogue 104

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Mossberg Pressed Steel Corporation
ATTLEBORO, MASS., U. S. A.
Selson Machine Tool Co. Ltd., London, Eng.

Keeping Pace with Progress

(*Continued from page 297*)

A Second Inspection

THE passage of a shipping date without the lot prepared for shipment is a major crime in the mill. Before the shipment goes forward, the quality must be checked again by the inspection and metallurgical departments, both of which maintain organizations and equipment for testing within the mill but outside the jurisdiction of the operating and production departments. Only after their O. K. has been placed on the results of chemical and physical tests on the finished products are those products loaded into cars or trucks bound for the customer's plants.

✦ ✦ ✦

Customer Service

EVEN after the shipment has reached the customer's plant, the mill's responsibility does not cease. The wire must perform satisfactorily or the order will not be repeated and the mill is interested primarily in the repeat orders. Members of the operating and metallurgical departments are on the road constantly, advising specifications for new products and checking the performance of recent shipments and sample orders. In occasional cases of poor performance they attempt to determine the cause or locate the faulty practice either in the wire or rod mill or that of the customer.

✦ ✦ ✦

THIS article has attempted only to indicate the scope and the almost infinite amount of detail that goes into the preparation of a wide variety of manufacturer's and merchant wire in our plant and the manner in which the company has prepared and planned, by capital investment, to care for a wide range of customer's requirements. An even level of operations, steady employment for its workers, a very low labor turnover, and an ever increasing variety of wire products are but a few of the advantages that have accrued.

Tailor-Made Wire

TAILOR made wire is an actuality in the wire industry today. Trends of the times indicate that now, more than ever, buyers will favor those mills whose integrated operations and experience—steel plant to finished product—permit them to take the exact measurements of the customer's needs, to fit those measurements time after time with the same unvarying quality of finished material, and to ship those products with the dispatch of a modern mail order house.

✦ ✦ ✦

A Review of Recent Wire Patents

(*Continued from page 287*)

assignors to Callender's Cable and Construction Company Limited, London, England, a British company.

Each core comprises pre-separated wire conductors of non-circular cross section having an insulation body of laminated and impregnated paper about it.

✦ ✦ ✦

No. 2,038,935, ELECTRIC CABLE, Patented April 28, 1936 by Philip Vassar Hunter and Leslie Giddens Brazier, London, and Harry Hill, Belvedere, England, assignors to Callender's Cable and Construction Company Limited, London, England, a British company.

A number of superposed transversely crimped layers of paper are applied helically to the wire conductors, the layers having a slightly wavy disposition and being capable of increasing their length by a small amount, without the production of a large tensile stress in the layers. The paper is impregnated with the material remaining more or less liquid during the operation of the cable.

✦ ✦ ✦

'Round the World With the Wire Industry

(*Continued from page 292*)

New Steel Plant for United Kingdom

REPORTS of the possible construction of a large basic Bessemer plant at Jarrow (Tyneside) **England,** have been heard. The cost is placed at approximately $20,000,000, and the capacity at some 350,000 tons per year. No definite information regarding this matter has been received, and some sources hold that it will probably not materialize—at least on the reported scale. Some concern has been expressed over the possible "over-expansion" of production facilities.

Notice of Patent Issuance Relating To Automatic Dielectric Testing

PATENT No. 2,043,528, issued June 9, 1936, covering a system of automatic insulation resistance and dielectric testing has just been granted by the United States Patent Office to Ralph L. Davis.

THIS patent while pending in the United States Patent Office was involved in an interference with an application of the Western Electric Company.

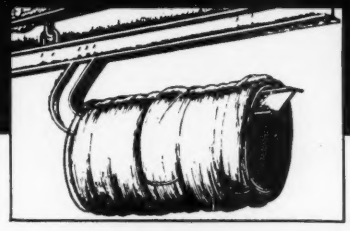
THE R. L. Davis Electric Company, Inc., manufacturers of apparatus coming under this patent, intend to vigorously enforce rights granted under this patent against any infringers.

R. L. Davis Elec. Co., Inc.

340 CENTER ST.

WALLINGFORD, CONN.

WRITE FOR DATA ON NEW OAKITE COATING MATERIALS



Without obligation on your part, let us send you data regarding recent developments in Oakite coating materials. Or, far better, let us demonstrate in a practical way, under your supervision and direction the advantages, the improved appearance of finished product that result from the use of these NEW coating materials.

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A memorable event—

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Since then, Duriron has been "beaten into plowshares"—into pumps, valves, pipe and fittings, tank outlets, ejectors, steam jets, exhaust fans and many other forms to lower the cost of industrial acid handling in thousands of plants.

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FOR CARBON STEELS ▲ ▲ ▲

▲ ▲ ▲

The strong passivating effect of this excellent inhibitor insures a bright finish and forms a sound basis for a bright drawing technique—

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DELANY CHEMICAL CO.

COTTMAN AND MILNOR STS.,
PHILADELPHIA, PA.

A New Galvanizing Furnace

(*Continued from page 293*)

A THIRD effect of these core busters is to so baffle the tubes that the combustion is completed in the upper portion of the tube, thereby concentrating the greatest amount of heat at the upper part of the kettle where it is most needed. The lighting of these tubes is accomplished by actuating a button.

✦ ✦ ✦

THERE are nine major advantages to this type of heat application for galvanizing kettles which affect materially the economy of operation and quality of product which may be reviewed as follows:

1—No possibility of flame impingement on the kettle.

By referring to the illustration on page 286 it can be easily seen that the burners and the flame given off are entirely self contained in the tubes. There can be no possibility of flame impingement on the kettle. Neither is there any heat flow against the side walls of the kettle. The heating area is a tight chamber utilizing every bit of heat given off by the glowing tubes for the purpose of heating the kettle and losing no heat to the outside. There is an entire absence of any burning gas or gas flow in this chamber and the heat against the kettle walls, therefore, results in the softest possible quality.

2—Perfect control of heat input from top to bottom of the kettle.

It is recognized the two greatest sources of heat loss in galvanizing kettles are—first—radiation from the top. Secondly:—from the work immersed in the top half of the kettle. These two reasons alone require that the greatest heat be applied to the upper portions of the kettle.

But the necessity of high heat is more fundamental than either of these reasons and has to do with the dross formation. We all know that to heat a galvanizing kettle from the bottom, or up through the dross, or too low on the sides, or by the use of too concentrated a heat transfer area, creates a dross flow upward when it should be downward and produces more and more dross. Heat application too low results also in a dross continuated galvanizing area with the resulting bad effects on bonding, smoothness of coat, etc.

By the use of the core busters referred to above, the heat given off by the tubes may be controlled in any manner desired by the designer and enables him to control to a nicety the heat application from top to bottom of the kettle.

3—Perfect control of heat input from end to end of the kettle.

By reference to the cuts herewith, it will be noted that perfect heat control from end to end of the kettle can be had. The importance of this feature to the continuous galvanizer can be recognized at once, and is accomplished by the control of the individual tubes, which are

adjustable to suit any given galvanizing situation existent.

4—Low dross losses.

In the forepart of this article the writer referred to actual results as to dross on a similar type of heat application. The data given applies to this caption. Ease of heat input, softness of heat application, absence of gas flow on the side walls, and, of most importance, positive control of any dross flow within the molten zinc make conclusively for low dross losses in this type of furnace.

5—Long kettle life.

The dissolving away of the side plates of the kettle makes a large contribution to dross losses. By the same reasoning, low dross losses make for long life of the kettle. The soft glowing heat given off by these picturesque tubes delivers to the kettle the finest quality of heat ever seen by the writer in twenty years of experience in designing galvanizing installations.

6—Low fuel cost.

In this design there is no opening in the heat chamber. Every B. T. U. delivered for use by the tube is held ready for service in heating the kettle.

7—Availability for either gas or oil.

So great is the flexibility of the design that either gas can be burned direct, or oil by conversion to gas by the simple use of a gasofier may be just as well adapted. In some localities this means a very great economy in fuel.

8—Kettle can be replaced without disturbing the setting brickwork.

This installation is so designed that when eventually a replacement of kettle is considered advisable, this replacement may be accomplished simply by lifting out the old and dropping in the new kettle. The advantage of this procedure over the old rebuilding process is apparent both in economy and saving of operating time.

9—Compact setting.

Due to the use of a grade of insulating brick usable in this type of furnace and the fundamental design of the furnace, the distance between the side walls of the kettle and outside brickwork is lessened some 10″ over the latest type impact fired designs, and without any additional heat losses. The advantage gained here will be recognized by those operators working directly on the kettle.

✦ ✦ ✦

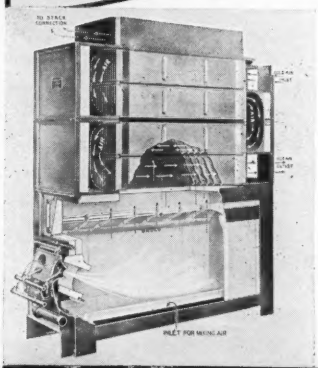
Numerous Features at A.S.T.M. Meeting

A LARGE number of technical papers and reports are scheduled for presentation during the 1936 annual meeting of the American Society for Testing Materials, to be held in Atlantic City from June 29 to July 3, inclusive.

✦ ✦ ✦

A NUMBER of papers deal with copper and copper alloy wire, including papers on torsion and flexure testing of copper wire, effect of time on tensile properties of hard-drawn copper wire and impact bend testing of wire. Several interesting committee reports will complete this session.

2 FACTS TO KEEP IN MIND



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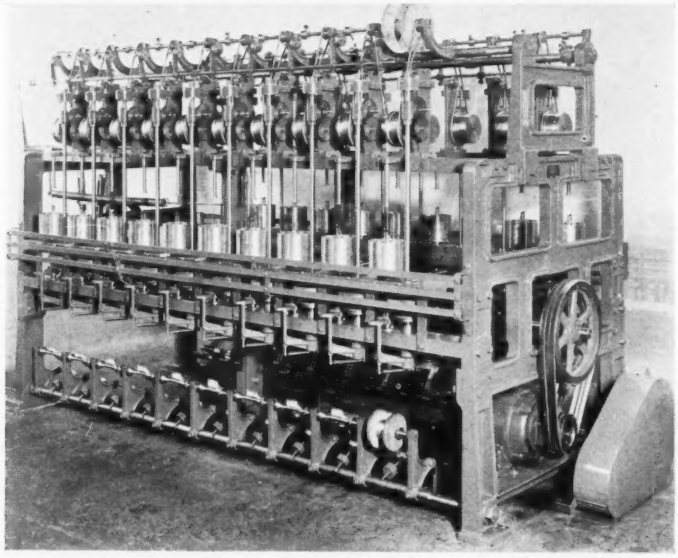

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Washington, D. C.

Exports and Imports of Wire

(*Continued from page 289*)

(4,589 tons) was of pig iron (4,503), and welded pipe (86). France was the fifth supplier of the month, its total of 2,467 tons being largely made up of shapes (1,150), bars, whether solid or hollow (909), ferro-manganese (139), and sheets, skelp, and sawplate (114). Sweden ranked next sending shipments to a total of 2,741 tons, of which the outstanding items were wire rods (1,004), bars, whether solid or hollow (488), 'other pipe' (288), round iron and steel wire (299), flat wire and strip steel (203), and pig iron (164).

✦ ✦ ✦

IMPORTS of **card clothing** (22,360 square feet valued at $26,612) continued their upward trend and increased 70 percent in quantity and 31 percent in value when compared with the trade in the previous month. The suppliers were the United Kingdom (15,044 square feet valued at $21,404), Germany (6,824 square feet valued at $3,745), France (6,824 square feet valued at $622), and Switzerland (117 square feet valued at $741).

✦ ✦ ✦

THE trade in **wire cloth and screening** (85,676 square feet) registered an increase (13.2 percent) over that in February, and was covered chiefly by Germany (37,459 square feet), the Netherlands (27,454 square feet), Canada (8,897 square feet), and France (8,665 square feet).

✦ ✦ ✦

RECEIPTS of **fourdrinier and other paper-making wire** (39,990 square feet) declined 27.4 percent from those received in February and were purchased from Germany (19,376 square feet), Austria (12,643 square feet), and France (2,050 square feet).

✦ ✦ ✦

THE upward movement in imports of **wire heddles** continued when the 642,000 pieces received from Japan (542,000 pieces), and Switzerland (100,000 pieces) increased (21.2 percent) over the total which came in during February.

IMPORTS of wire **fencing and netting** — galvanized before weaving (595,200 square feet) registered a conspicuous increase (470 percent) over the February trade, and were received from Belgium (500,400 square feet), and Germany (94,800 square feet). Of the galvanized after weaving grade, a very pronounced decline (77 percent) set in (when compared with February) when only 724,980 square feet were received from Belgium (720,000 square feet), and Germany (4,980 square feet).

✦ ✦ ✦

EXPORTS of iron and steel wood screws during March, 1936 totaled 38,579 gross valued at $4,475. Of this total the Union of South Africa took 18,789 gross valued at $1,836; Salvador 4,072 gross valued at $343; Cuba, 2,337 gross valued at $255; Dominican Republic 2,115 gross valued at $257; Philippine Islands 1,700 gross valued at $149; Canada 1,676 gross valued at $146; China 1,500 gross valued at $150.

✦ ✦ ✦

EXPORTS of brass wood screws during the same period amounted to 5,547 gross valued at $2,764. Of this total Canada took 1,962 gross valued at $903; Venezuela 730 gross valued at $179; Philippine Islands 660 gross valued at $960; Cuba 564 gross valued at $163; United Kingdom 345 gross valued at $201.

✦ ✦ ✦

IMPORTS of wood screws during the same period amounted to 45,247 gross valued at $3,664, of which amount Belgium supplied 22,000 gross valued at $2,066; Japan 12,509 gross valued at $579; Sweden 10,538 gross valued at $969.

✦ ✦ ✦

Cartel Agreement Concluded by Czechoslovak Wire Screw Manufacturers.

CZECHOSLOVAK wire screw producers concluded (on March 12, 1936) a cartel agreement to expire December 31, 1940. It will operate through the "Vrut" Sales Office for Wood Screws, Ltd., Prague.

HIGHER EFFICIENCY ON BRAIDERS - - -

Wire mills that have equipped their braiding machines with *Productimeters* find that machine efficiency goes up, cost of braiding goes down, and operators make better wages. Installation costs have been paid off in from 6 to 12 months.

This is a typical installation of a geared Rotary *Productimeter* on a 24 Carrier Wardwell Braider. May we send a field engineer to estimate your requirements? For information on wire measuring machines send for Bulletin 3.

DURANT MFG. CO. Productimeters
THE SPEEDOMETERS OF INDUSTRY

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Learn about PARALAN

Paralan will give your finished wire and wire products protection from atmospheric corrosion in the mill and in shipping. Paralan-coated wire can be spot welded or soldered without cleaning. Also, Paralan leaves surfaces in good condition for all types of finishes—enameling, japanning, lacquering, plating, etc.

Write for further information. We may be able to solve your difficulties.

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HIGH SPEED
Welding Wire Straightening and Cutting Machinery
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Continuous Straightening and Cutting Machinery
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SILVER LEADED Wire Drawing Powder Olivil For Liquor Finish
For Reduction of Music Wire, Stainless and Alloys.
124 Exeter St. T. GORE Brooklyn, N. Y.

Outstanding Personalities of the Wire Industry

(*Continued from page 296*)

Stanley A. Knisely Made Director of Advertising for Republic Steel Corp.

STANLEY A. KNISELY, formerly manager of advertising and sales promotion division of Republic Steel Corporation, has been appointed director of advertising with direct supervision of all advertising of the corporation and its subsidiaries.

✦ ✦ ✦

MR. Knisely entered the newspaper field as a cub reporter on the "Canton Daily News". He rose to become managing editor and from there went to the "Cleveland Plain Dealer" as Telegraph editor during the war and later city editor. In 1920 he became affiliated with the National Paving Brick Association as assistant secretary in charge of advertising. He became Director of Research and Advertising of the Flat Rolled Steel Association in 1927 and in 1934 came to Republic as Manager of the Advertising and Sales Promotion Division where he remained until his new appointment as Director of Advertising.

✦ ✦ ✦

CHESTER W. RUTH has been made assistant director of advertising. He began his active association with steel advertising in 1920 with a Canton, Ohio, advertising agency. In 1926 he joined the advertising department of United Alloy Steel Company which was consolidated with the Central Steel Company to become Central Alloy Steel Corporation. Throughout the mergers he remained in the advertising department until 1930 when the company became a unit of Republic Steel Corporation and Mr. Ruth was chosen assistant advertising manager of the corporation. He remained in that capacity until his recent appointment as assistant director of advertising.

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FORREST H. RAMAGE, formerly assistant manager of the advertising and sales promotion division, has been named sales promotion manager in charge of sales promotion activities which will be part of new product development division, headed by Julius Kahn, who recently became vice president of Republic in charge of product development.

✦ ✦ ✦

MR. Ramage, a graduate of Michigan College of Mining and Technology, became associated with the Republic Iron & Steel Company in 1926 as a sheet mill metallurgist. In 1927 he was assigned to the New York district sales office as sales engineer. In 1929, he was transferred to the Youngstown general office on the special development of Toncan iron pipe, and in 1931 was chosen assistant manager of the advertising and sales promotion division of Republic. As manager of sales promotion, Mr. Ramage will enlarge his scope of activity to include the promotion and development of new products as well as continue with his previous duties.

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FOLDED PAPER FLATS
PAPER INSULATION YARNS
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Rod Frames—16" Frames, 8" Frames—Take-Up Frames, Wire Pointers—Puller Tongs.
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Wire Drawing Diamond Dies
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WIRE DIE CORPORATION
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Tel. Col. 5-1340

A New Pyrometer Catalog

A VERY complete catalog describing Tag pyrometers, photo-electrically balanced recorders, indicators, controllers, recording controllers, potentiometers for thermocouples, slide-wire wheatstone bridges for resistance thermometers and accessories has been issued by the **C. J. Tagliabue Mfg. Co.** of Brooklyn, N. Y. This catalog not only describes the mechanism of the various instruments but gives an excellent indication of their various uses. Copies can be obtained by addressing the editor of WIRE AND WIRE PRODUCTS and requesting Catalog No. 1101A.

✦ ✦ ✦

Corrosion and Heat Resisting Stainless Steels

"CORROSION and Heat Resisting Stainless Steels" is the title of a new bulletin issued by the **Rustless Iron and Steel Corp.**, of Baltimore, Md.

✦ ✦ ✦

THIS bulletin gives the detailed analysis of the various types of stainless steel produced by this company, together with a description of their principal uses. Copies can be obtained by addressing the editor of WIRE AND WIRE PRODUCTS.

✦ ✦ ✦

Scientific Instruments and Laboratory Apparatus

A VERY interesting bulletin describing scientific instruments and laboratory apparatus, including analytical balances, photo-electric apparatus, microtomes, microscopes, etc., has been issued by **Pfaltz & Bauer, Inc.**, of New York, N. Y.

✦ ✦ ✦

COPIES of this bulletin can be obtained by addressing the editor of WIRE AND WIRE PRODUCTS.

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POSITION WANTED BY
competent man having sixteen years experience drawing steel wire, both wet and dry. Familiar with drawing of alloy steels, also flat box and stitching wires. Have acted in supervisory capacity for past ten years. Now employed.
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19 W. 34th St. New York

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BUYERS' GUIDE

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ABRASIVES—
Norton Co., Worcester, Mass.

ANNEALING POTS AND BOXES
Scudder, E. J., Fdry. & Machine Co., Trenton, N. J.

ANODES—Nickel
Seymour Mfg. Co., Seymour, Conn.

ARMORING EQUIPMENT
Amer. Insulating Mach'y Co., Phila., Pa.
Elevator Supplies Co., Inc., Hoboken, N. J.
New England Butt Co., Providence, R. I.
Seymour Mfg. Co., Seymour, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.

BAKERS—Rod and Wire
Lindberg Engineering Co., Chicago, Ill.
Morgan Construction Co., Worcester, Mass.
Morrison Engineering Co., Cleveland, O.
Ross Engineering Corp., New York, N. Y.

BORON CARBIDE—
Norton Co., Worcester, Mass.

CARRIERS—High Speed Braider
Mossberg Pressed Steel Corp., Attleboro, Mass.

CEMENTS—Refractory
Norton Co., Worcester, Mass.

CHEMICALS—Cleaning
American Chemical Paint Co., Ambler, Pa.
Delany Chemical Co., Tacony Station, Philadelphia, Pa.
Oakite Products, Inc., New York, N. Y.
Parkin Co., The Wm., Pittsburg, Pa.

CLEANING & PICKLING EQUIPMENT
Broden Construction Co., Cleveland, O.
Duriron Co., The, Dayton, O.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

COATING—Protective
American Lanolin Corp., Lawrence, Mass.

COILERS—Sheet, Strip and Wire
Broden Construction Co., Cleveland, O.
Farrel-Birmingham Co., Ansonia, Conn.
H. J. Ruesch Machine Co., Newark, N. J.

COMPOUNDS—Cleaning
Oakite Products, Inc., New York, N. Y.

CONDUITS—Iron and Steel
Youngstown Sheet & Tube Co., Youngstown, Ohio.

CRANES—Block Stripping
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.

CRANES—Cleaning House
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.

CRANES—Electrical Traveling
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.

CRANES—Wire Mill
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

DIES—Diamond
Balloffet Diamond Wire Dies Co., Inc., N. Y. C.
Cochaud Wire Die Co., New York.
Driver Harris Co., Harrison, N. J.
Kelly Wire Die Corp., New York, N. Y.
Union Wire Die Corp., New York, N. Y.
Vianney Wire Die Works, New York.

DIES—Lead Extrusion
John Robertson Co., Brooklyn, N. Y.

DIES—Repairs & Re-Cutting
Cochaud Wire Die Corp., New York.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Union Wire Die Corp., New York, N. Y.
Vianney Wire Die Wks., N. Y.

DIES—Rod and Tube Drawing
Carboloy Co., Inc., Newark, N. J.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Union Wire Die Corp., New York, N. Y.
Vanadium Alloys Steel Co., Pittsburgh, Pa.
Vianney Wire Die Works, New York, N. Y.

DIES—Tantalum Carbide
Kelly Wire Die Corp., New York, N. Y.
Vanadium Alloys Steel Co., Pittsburgh, Pa.
Vianney Wire Die Works, New York, N. Y.

DIES—Tungsten Carbide
Carboloy Co., Inc., Newark, N. J.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Union Wire Die Corp., New York, N. Y.
Vanadium Alloys Steel Co., Pittsburgh, Pa.
Vianney Wire Die Works, New York, N. Y.

DRAW BENCHES
H. J. Ruesch Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Machine Co., Trenton, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.

DRUMS—Vulcanizing
Mossberg Pressed Steel Corp., Attleboro, Mass.

ENGINEERS—Consulting Galvanizing
W. H. Spowers, Jr., New York, N. Y.

ENGINEER—Consulting Wire Mill
Lewis, Kenneth B., New York, N. Y.

BUYERS' GUIDE, Continued

ENGINEERS—CONSULTING—Non-ferrous Wire Mill
New Products Development Corp., Yonkers, N. Y.

EYELETS—Brass or Zinc
Platt Bros. & Co., The, Waterbury, Conn.

FILLERS—Paper for Cable
E. W. Twitchell, Inc., Phila., Pa.

FURNACES—Annealing
Electric Furnace Co., Salem, O.
Lindberg Engineering Co., Chicago, Ill.
Ross Engineering Corp., New York, N. Y.
Surface Combustion Co., Toledo, O.
Wilson, Lee, Engineering Co., Cleveland, O.

FURNACES—Automatic
Electric Furnace Co., Salem, O.
Lindberg Engineering Co., Chicago, Ill.
Surface Combustion Co., Toledo, O.

FURNACES—Bright Annealing
Electric Furnace Co., Salem, O.
Lindberg Engineering Co., Chicago, Ill.
Ross Engineering Corp., New York, N. Y.
Surface Combustion Co., Toledo, O.

FURNACES—Electric
Electric Furnace Co., Salem, O.
Lindberg Engineering Co., Chicago, Ill.

FURNACES—Hardening and Tempering
Electric Furnace Co., Salem, O.
Lindberg Engineering Co., Chicago, Ill.
Surface Combustion Co., Toledo, O.

FURNACES—Lead Melting
Electric Furnace Co., Salem, O.
Lindberg Engineering Co., Chicago, Ill.
John Robertson Co., Brooklyn, N. Y.
Surface Combustion Co., Toledo, O.

FURNACES—Non-Oxidizing
Electric Furnace Co., Salem, O.
Lindberg Engineering Co., Chicago, Ill.
Surface Combustion Co., Toledo, O.
Wilson, Lee, Engineering Co., Cleveland, O.

FURNACES—Wire, Strip and Sheet
Electric Furnace Co., Salem, O.
Lindberg Engineering Co., Chicago, Ill.
Ross Engineering Corp., New York, N. Y.
Surface Combustion Co., Toledo, O.
Wilson, Lee, Engineering Co., Cleveland, O.

GALVANIZING EQUIPMENT—Tube Fired
Wilson, Lee, Engineering Co., Cleveland, O.

GEARS—Wire Mill
Farrel-Birmingham Co., Ansonia, Conn.

GRINDERS—Roll
Farrel-Birmingham Co., Ansonia, Conn.
Norton Co., Worcester, Mass.

HANDLING EQUIPMENT—Material
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.

HOISTS—Electric Traveling
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.

HOISTS—Monorail
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.

INHIBITORS
American Chemical Paint Co., Ambler, Pa.
Delany Chemical Co., Tacony Station, Philadelphia, Pa.
Parkin Co., The Wm., Pittsburgh, Pa.

INSULATION—Cable or Cable Filler
E. W. Twitchell, Inc., Phila., Pa.

LATHES—Die Reaming
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

LIME—Pulverized
Amer. Lime & Stone Co., Bellefonte, Pa.

LININGS—For Acid Tanks
American Hard Rubber Co., New York, N. Y.
Goodrich, B. F., Rubber Co., Akron, O.

LUBRICANTS—Wire Drawing
Gore, T., Brooklyn, N. Y.
R. H. Miller Co., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.

MACHINERY—Armoring (Cable, Wire Hose)
American Insulating Mach'y Co., Phila., Pa.
Elevator Supplies Co., Inc., Hoboken, N. J.
New England Butt Co., Providence, R. I.
John Robertson Co., Brooklyn, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Thomson-Gibb Electric Welding Co., Lynn, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Braiding
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Brazing
Thomson-Judd Wire Machinery Co., Lynn, Mass.

MACHINERY—Bunching
Amer. Insulating Mach'y Co., Phila., Pa.
Elevator Supplies Co., Inc., Hoboken, N. J.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Bundling, Scrap
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Watson Machine Co., Paterson, N. J.

MACHINERY—Cable, Electric
American Insulating Machinery Co., Philadelphia, Pa.
Elevator Supplies Co., Inc., Hoboken, N. J.
New England Butt Co., Providence, R. I.
Thomson-Gibb Electric Welding Co., Lynn, Mass.
Watson Machine Company, Paterson, N. J.

MACHINERY—Chain Making
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Closing
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Coil Winding
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Coilers
Broden Const. Co., Cleveland, O.
Elevator Supplies Co., Inc., Hoboken, N. J.
Farrel-Birmingham Co., Ansonia, Conn.
Morgan Const. Co., Worcester, Mass.
H. J. Ruesch Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Waterbury-Farrel Foundry & Machine Co. Waterbury, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Copper Wire Drawing and Rolling
Elevator Supplies Co., Inc., Hoboken, N. J.
Farrel-Birmingham Co., Ansonia, Conn.
H. J. Ruesch Machine Co., Newark, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Covering Wire—
Syncro Machine Co., Newark, N. J.

MACHINERY—Cutting
Broden Construction Co., Cleveland, O.
Farrel-Birmingham Co., Ansonia, Conn.
Hallden Machine Co., Thomaston, Conn.
F. B. Shuster Co., New Haven, Conn.
W. A. Schuyler, New York, N. Y.
Sleeper & Hartley, Worcester, Mass.

MACHINERY—Enameling
American Insulating Mach'y Co., Phila., Pa
Elevator Supplies Co., Inc., Hoboken, N. J.

MACHINERY—Extruding
John Robertson Co., Brooklyn, N. Y.
Watson Machine Co., Paterson, N. J.

MACHINERY—Flat Wire
Broden Construction Co., Cleveland, O.
H. J. Ruesch Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Forming
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Galvanizing Wire
Broden Construction Co., Cleveland, O.
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Gang Winders
H. J. Ruesch Machine Co., Newark, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Grinding
Norton Co., Worcester, Mass.

MACHINERY—Insulating
American Insulating Machinery Co., Phila
Elevator Supplies Co., Inc., Hoboken, N. J.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Newark, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Lead Encasing Presses, etc.
John Robertson Co., Brooklyn, N. Y.

MACHINERY—Lead Stripping
John Robertson Co., Brooklyn, N. Y.
Watson Machine Co., Paterson, N. J.

MACHINERY—Lock Washer
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Magnet Wire
American Insulating Mach'y Co., Phila., Pa.
Elevator Supplies Co., Inc., Hoboken, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Material Handling
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.

MACHINERY—Measuring Wire & Cable
Davis, R. L., Electric Corp., Wallingford, Conn.
Durant Mfg. Co., Milwaukee, Wis., and Providence, R. I.
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Nail and Tack
Glader, Wm., Machine Works Co., Chicago, Ill.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Panning
American Insulating Machinery Co., Phila.
Elevator Supplies Co., Inc., Hoboken, N. J.

MACHINERY—Pointing
Broden Construction Co., Cleveland, O.
Elevator Supplies Co., Inc., Hoboken, N. J.
H. J. Ruesch Machine Co., Newark, N. J.
E. J. Scudder Foundry & Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Rod Mill
Broden Construction Co., Cleveland, O.
Farrel-Birmingham Co., Ansonia, Conn.
Morgan Const. Co., Worcester, Mass.
H. J. Ruesch Machine Co., Newark, N. J.
W. A. Schuyler, New York, N. Y.

MACHINERY—Rolling Mill
Broden Construction Co., Cleveland, O.
Elevator Supplies Co., Inc., Hoboken, N. J.
Farrel-Birmingham Co., Ansonia, Conn.
Morgan Construction Co., Worcester, Mass.
H. J. Ruesch Machine Co., Newark, N. J.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Rubber Strip Covering
Farrel-Birmingham Co., Ansonia, Conn.
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Rubber Tubing and Straining
Farrel-Birmingham Co., Ansonia, Conn.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Screw Wire
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Special
American Insulating Mach'y Co., Phila. Pa.
Elevator Supplies Co., Inc., Hoboken, N. J.
Broden Construction Co., Cleveland, O.
H. J. Ruesch Machine Co., Newark, N. J.
E. J. Scudder Foundry and Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Special—Combination Machine for Drawing, Cutting-to-length, Straightening and Reeling Bars from Coil in One Operation (Shumag Type)—
W. A. Schuyler, New York, N. Y.

MACHINERY—Spooling
American Insulating Machinery Co., Phila.
Elevator Supplies Co., Inc., Hoboken, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Spring Making
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Staple
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Straightening
Broden Construction Co., Cleveland, O.
Hallden Machine Co., Thomaston, Conn.
H. J. Ruesch Machine Co., Newark, N. J.
W. A. Schuyler, New York, N. Y.
F. B. Shuster, New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Stranding
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Thomson-Judd Wire Machinery Co., Lynn, Mass.
Watson Machine Co., Paterson, N. J.

BUYERS' GUIDE, Continued

MACHINERY—Strip Steel
Broden Const. Co., Cleveland, O.
H. J. Ruesch Machine Co., Newark, N. J.

MACHINERY—Swaging
Elevator Supplies Co., Inc., Hoboken, N. J.
H. J. Ruesch Machine Co., Newark, N. J.
Sleeper & Hartley, Worcester, Mass.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Taping
Amer. Insulating Mach. Co., Phila., Pa.
Elevator Supplies Co., Inc., Hoboken, N. J.
New England Butt Co., Providence, R. I.
Thomson-Judd Wire Machinery Co., Lynn, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Testing Size of Wire
R. L. Davis Elec. Co., Wallingford, Conn.

MACHINERY—Testing Wire
Henry L. Scott Co., Providence, R. I.

MACHINERY—Tinsel Rolling Mills
Amer. Insulating Mach'y Co., Phila., Pa.
Elevator Supplies Co., Inc., Hoboken, N. J.

MACHINERY—Trolley Wire
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Tube Mill
H. J. Ruesch Machine Co., Newark, N. J.

MACHINERY—Welding Wire
Micro Products Co., Chicago, Ill.
F. B. Shuster Co., New Haven, Conn.
Thomson-Judd Wire Machinery Co., Lynn, Mass.

MACHINERY—Winding
American Insulating Mach'y Co., Phila., Pa.
Elevator Supplies Co., Inc., Hoboken, N. J.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Drawing
American Insulating Machinery Co., Phila.
Broden Const. Co., Cleveland, Ohio.
Elevator Supplies Co., Inc., Hoboken, N. J.
Morgan Construction Co., Worcester, Mass.
H. J. Ruesch Machine Co., Newark, N. J.
E. J. Scudder Foundry & Machine Co., Trenton, N. J.
W. A. Schuyler, New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Auburn, R. I.
Thomson-Judd Wire Machinery Co., Lynn, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Wire Rope
New England Butt Co., Providence, R. I.
Thomson-Judd Wire Machinery Co., Lynn, Mass.
Watson Machine Company, Paterson, N. J.

MACHINERY—Wire Tinning
American Insulating Mach'y Co., Phila., Pa.
Elevator Supplies Co., Inc., Hoboken, N. J.

MACHINERY—Wrapping Wire
W. A. Schuyler, New York, N. Y.

MATERIAL HANDLING EQUIPMENT—
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.

MONORAIL SYSTEMS—
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.

NICKEL SILVER AND PHOSPHOR BRONZE—Rod, Wire and Strip
Hudson Wire Co., Ossining, N. Y.
Seymour Mfg. Co., Seymour, Conn.

OVENS—Annealing or Drying
Lindberg Engineering Co., Chicago, Ill.
Ross Engineering Corp., New York, N. Y.

PAPER—Insulating
E. W. Twitchell, Inc., Phila., Pa.

PICKLING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Delany Chemical Co., Tacony Station, Philadelphia, Pa.
Parkin Co., The Wm., Pittsburgh, Pa.

PICKLING—Tank Linings
American Hard Rubber Co., New York, N. Y.
Goodrich, B. F., Rubber Co., Akron, O.

POTS—Annealing, Case Hardening and Tempering
Lindberg Engineering Co., Chicago, Ill.

POTS—Lead Melting
Farrel-Birmingham Co., Ansonia, Conn.
John Robertson Co., Brooklyn, N. Y.

PRESSES—Hydraulic and Mechanical
Farrel-Birmingham Co., Ansonia, Conn.
John Robertson Co., Brooklyn, N. Y.

PRESSES—Lead
John Robertson Co., Brooklyn, N. Y.

PULLERS—Wire
E. J. Scudder Fdry. & Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.

PUMPS—Hydraulic
John Robertson Co., Brooklyn, N. Y.

REEL AND TENSION STAND—
Sleeper & Hartley, Inc., Worcester, Mass.

REEL CRUTCHES
Watson Machine Co., Paterson, N. J.

REELS—Annealing and Stranding
Mossberg Pressed Steel Corp., Attleboro, Mass.

REELS—Impregnating
Mossberg Pressed Steel Corp., Attleboro, Mass.

REELS—Steel
Mossberg Pressed Steel Corp., Attleboro, Mass.

REFRACTORIES—High Temperature
Norton Co., Worcester, Mass.

ROD BAKERS—
Morrison Engineering Co., Cleveland, O.

RODS—Wire—Non Ferrous
Hudson Wire Co., Ossining, N. Y.
Platt Bros. & Co., The, Waterbury, Conn.
Seymour Mfg. Co., Seymour, Conn.

RODS—Wire—Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Laclede Steel Co., St. Louis, Mo.
Pittsburgh Steel Co., Pittsburgh, Pa.
Republic Steel Co., Youngstown, O.
Wheeling Steel Corp., Wheeling, W. Va.
Youngstown Sheet & Tube Co., Youngstown, Ohio.

ROLLS—
Farrel-Birmingham Co., Ansonia, Conn.

RUST PROOF COMPOUND
American Lanolin Co., Lawrence, Mass.

SHEET—Steel
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Republic Steel Co., Youngstown, O.
Superior Sheet Steel Co., Canton, O.
Wheeling Steel Corp., Wheeling, W. Va.
Youngstown Sheet & Tube Co., Youngstown, O.

SOAPS—Wire Drawing
Gore, T., Brooklyn, N. Y.
R. H. Miller Co., Homer, N. Y.

SPOOLS—Steel
Mossberg Pressed Steel Corp., Attleboro, Mass.

STRIP—Brass, Zinc and Non Ferrous
Hudson Wire Co., Ossining, N. Y.
Platt Bros. & Co., The, Waterbury, Conn.
Seymour Mfg. Co., Seymour, Conn.

STRIP—Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Laclede Steel Co., St. Louis, Mo.
Pittsburgh Steel Co., Pittsburgh, Pa.
Republic Steel Co., Youngstown, O.
Wheeling Steel Corp., Wheeling, W. Va.

TANKS—Compound
Watson Machine Co., Paterson, N. J.

TANKS—Pickling
Goodrich, B. F., Rubber Co., Akron, O.

TESTERS—Wire
Henry L. Scott Co., Providence, R. I.

TRAMRAIL SYSTEMS—
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.

TREADS—Safety
Norton Co., Worcester, Mass.

TRUCKS
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

TUBE BENDERS AND FORMERS
H. J. Ruesch Machine Co., Newark, N. J.

VALVES AND FITTINGS—Acid Proof
Duriron Co., The, Dayton, O.

VULCANIZERS
Watson Machine Co., Paterson, N. J.

VULCANIZING PANS
American Insulating Mach'y Co., Phila., Pa.

WIRE—Cold Heading
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Laclede Steel Co., St. Louis, Mo.
Pittsburgh Steel Co., Pittsburgh, Pa.
Republic Steel Corp., Youngstown, O.
Youngstown Sheet & Tube Co., Youngstown, O.
Wheeling Steel Corp., Wheeling, W. Va.

WIRE—Electric
Hudson Wire Co., Ossining, N. Y.
Seymour Mfg. Co., Seymour, Conn.

WIRE—Enameled For Coils
Winsted Div. of Hudson Wire Co., Winsted, Conn.

WIRE—Manufacturers
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Co., Kokomo, Ind.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Laclede Steel Co., St. Louis, Mo.
Pittsburgh Steel Co., Pittsburgh, Pa.
Republic Steel Co., Youngstown, O.
Wheeling Steel Corp., Wheeling, W. Va.
Youngstown Sheet & Tube Co., Youngstown, Ohio

WIRE—Nickel Silver and Phosphor Bronze
Hudson Wire Company, Ossining, N. Y.
Seymour Mfg. Co., Seymour, Conn.

WIRE—Non Ferrous to Specification For Special Purposes
Hudson Wire Co., Ossining, N. Y.
Seymour Mfg. Co., Seymour, Conn.
Winsted Div. of Hudson Wire Co., Winsted, Conn.

WIRE—Spring
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel and Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.
Republic Steel Co., Youngstown, O.
Seymour Mfg. Co., Seymour, Conn.
Youngstown Sheet & Tube Co., Youngstown, Ohio.

WIRE—Steel—Also Coppered Steel—Also Galvanized Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Laclede Steel Co., St. Louis, Mo.
Pittsburgh Steel Co., Pittsburgh, Pa.
Republic Steel Co., Youngstown, O.
Wheeling Steel Corp., Wheeling, W. Va.
Youngstown Sheet & Tube Co., Youngstown, Ohio.

WIRE AND STRIP—Brass, Zinc
Platt Bros. & Co., The, Waterbury, Conn.

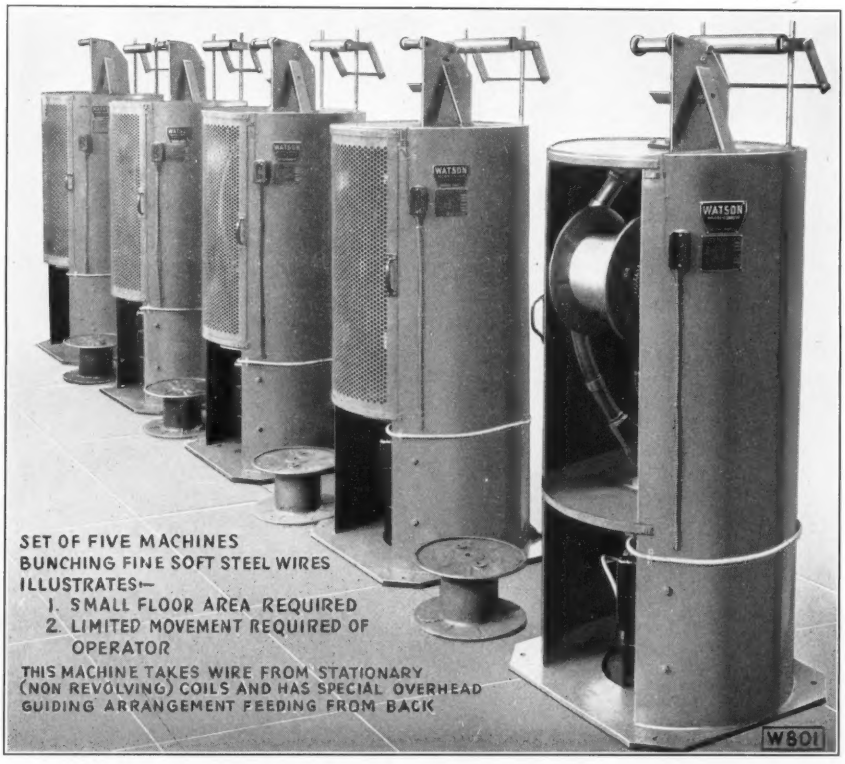
This is a carefully classified index of concerns who specialize in this industry and who advertise regularly in WIRE & WIRE PRODUCTS. Please mention WIRE when writing to these firms.

THE WATSON MACHINE COMPANY

ESTABLISHED 1845

PATERSON, NEW JERSEY, U. S. A.

ENGINEERS - FOUNDERS - MACHINISTS

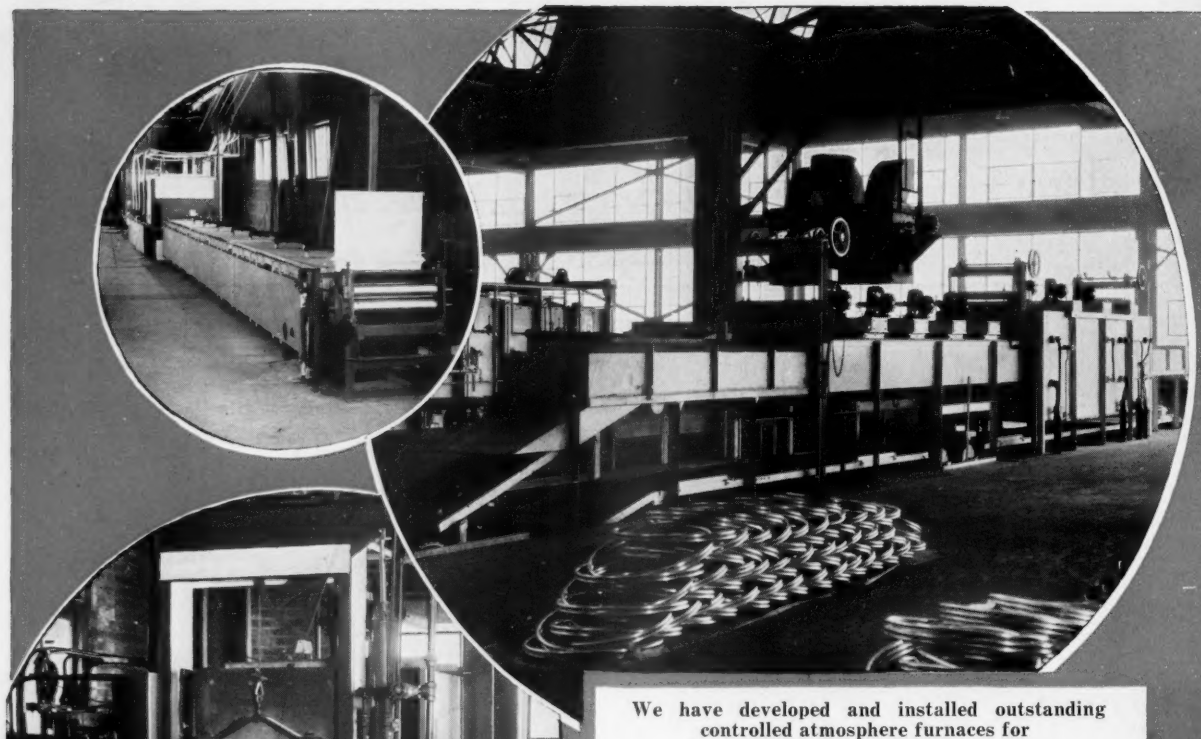

SET OF FIVE MACHINES
BUNCHING FINE SOFT STEEL WIRES
ILLUSTRATES—
1. SMALL FLOOR AREA REQUIRED
2. LIMITED MOVEMENT REQUIRED OF OPERATOR
THIS MACHINE TAKES WIRE FROM STATIONARY (NON REVOLVING) COILS AND HAS SPECIAL OVERHEAD GUIDING ARRANGEMENT FEEDING FROM BACK
WATSON
W801

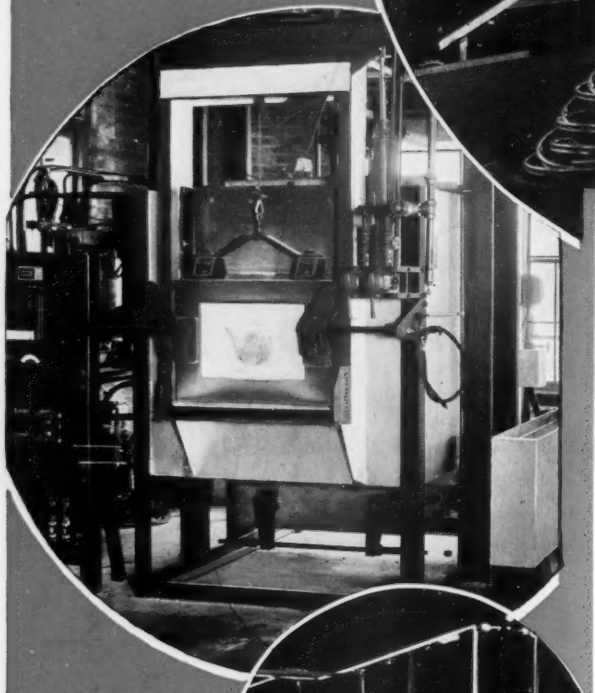
A modern high capacity installation of five WATSON BUNCHERS V7 for fine wire bunching, for single operator is shown above.

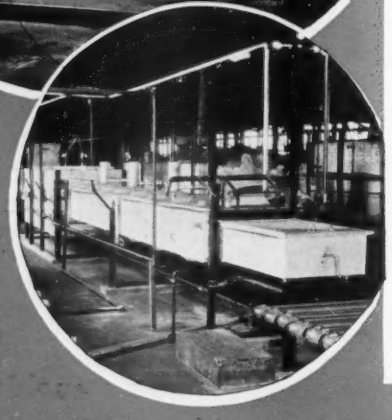
At 1″ lay 42,000 feet of strand is produced hourly.

Small floor area, and automatic electric stops enable single operator to take care of eight machines with ease.

Send for latest bulletin and prices.







We have developed and installed outstanding controlled atmosphere furnaces for

Bright Annealing Wire

Ferrous and non-ferrous wire is bright annealed in continuous and batch type furnaces we have built for this process.

Bright Annealing Tubing

Ferrous and non-ferrous tubing in coils and straight lengths bright annealed uniformly and continuously.

Bright Annealing Strip

The material comes out absolutely uniform in finish and anneal. Other advantages—less material in process, low operating cost, elimination of pickling and continuous operation.

Scale-Free Hardening Bolts, Etc.

Miscellaneous finished parts and products are bright hardened continuously with the highest degree of uniformity and with complete absence of scale.

Copper Brazing

The most intricate assemblies of stampings, machined parts, etc. are securely joined in these continuous furnaces—neatly and uniformly.

Consult with us on any of your heating or heat treating problems—we build the furnace to fit your job.

THE ELECTRIC FURNACE CO.

SALEM, OHIO.

Fuel Fired Furnaces

Electric Furnaces